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Minutes of Proceedings.

After-war Problems.

In appointing a committee to consider the problems likely to arise at the termination of the war, the council of the Surveyors' Institution showed an entirely praiseworthy readiness to render available in the national interest the special knowledge possessed by surveyors, as distinct from other professional men or from representatives of trade and industry. The general subject of the committee's reference divided itself naturally into two branches—urban and rural—a division which is clearly recognised in the very valuable reports which have just been published. Broadly speaking, the urban report deals with the steps which should be taken to meet the possibility of a period of acute unemployment after the war, and recommends the preparation of schemes for that purpose. In preparing the rural report, on the other hand, the committee were at once forced by the difficulty that agriculture, the principal industry concerned, does not lend itself to emergency measures. The recommendations under this head are therefore chiefly designed to secure prosperity to agriculture and the employment of more persons in that industry, rather than to meet any immediate emergency of unemployment. In considering the urban problem, the committee accepted at the outset four main principles—namely, (1) that the expenditure in respect of labour should form a considerable proportion of the total outlay; (2) that the work when completed should meet a well-recognised public need, and should partake as little as possible of the nature of unproductive relief works; (3) that the scheme should be capable of being definitely organised beforehand, and should be at once prepared, ready to be put into operation immediately on the emergency arising; (4) that the scheme should be so far as possible self-supporting. It is not surprising, in view of the adoption of these principles, that the primary method suggested by the committee for providing employment is the erection of new buildings—primarily, houses for the working classes. It is, of course, matter of common knowledge that there is at the present time a very acute shortage of housing accommodation, and that the position is steadily growing worse. The problem is one which on its merits calls for the most vigorous action immediately after the war, and if special works are to be undertaken for the relief of unemployment, none can be more appropriate than house building. Work of this character certainly complies with the first three of the principles laid down by the committee, while as regards the fourth, the committee point out that if, as appears to be the case, housing schemes will not be self-supporting, any adverse balance should be borne by the national exchequer as the contribution of the Government, which would be relieved from the necessity of keeping a large number of men with the Colours. Upon a careful consideration of the whole situation the committee were led to the conclusion that it can only be in the direction of public authorities undertaking responsibility for the housing schemes needed to meet the anticipated unemployment that a solution of the problem can successfully be sought. This conclusion is very significant, for it appears from the report that, as a matter of principle, the committee were unanimously of opinion that in the future, as in the past, the provision of houses would best be left to private enterprise, provided that that source of supply did not fail.

The report is a reasoned document, and, coming as it does from a body of experts, it is earnestly to be hoped that the recommendations which it contains will receive the consideration from the Government which they undoubtedly deserve. The main recommendation in regard to housing is that, in view of (*a*) the need of being prepared for a possible period of acute unemployment after the termination of the war, (*b*) the admitted shortage of working-class dwellings, and (*c*) the practical impossibility in existing circumstances of attracting private capital to that form of investment, the Government should request the councils of counties and county boroughs to arrange beforehand for the preparation of schemes for providing houses for the working classes with approximate estimates of cost, to be put into operation at once on unemployment being found to exist. As regards finance, it is recommended that the

necessary funds be provided by the Treasury on terms not less favourable than those on which they were prepared to make advances under the Housing (No. 2) Act, 1914, and further, that the rents to be charged be not less than those ruling in the neighbourhood for similar accommodation.

* * *

Earthwork Dam Construction.

Apparently the engineers of the Kachelus reservoir, on the Yakima river in Washington, have had rather a nasty job before them, and the manner in which they are dealing with it is described in the *Engineering Record* of New York by Mr. C. E. Crowneyer. The dam consists of a bank, and a core wall and puddled clay. The core wall for its entire length is founded on gravelly clay, which is said to be "practically impervious." The word "practically" in this connection at once suggests possibilities of trouble, but worse follows. At a depth of 6 ft. below the bottom of the core wall, test holes disclosed a fine sand under much pressure—presumably water pressure. This sand formation is of considerable depth, and test holes were driven for a depth of 35 ft. without passing through. This sand is therefore considered too deep to pass through with a cut-off wall, and the concrete core wall was therefore founded on the overlying clay.

This method of construction gives the English engineer a very uncomfortable feeling, and suggests possibilities with which anyone who has had to deal with water pressure and running sand, and structures founded on material overlying running sand, will be familiar. It seems that the engineers are of opinion that there is no connection between the water in the lake above the dam and the stratum of fine sand, owing to a difference in the water levels. A number of drill holes were made on the line of the conduit through the dam, and no relation seemed to exist between the water level in these holes and the water level in the lake. Further, it appeared that the lake bottom was covered with from 5 ft. to 20 ft. depth of blue mud of an impervious character. To those who have not the full facts before them the arguments are not as convincing as could be wished, and one cannot escape the impression of a dam subject to upward pressure from beneath, and of cut-off walls resting on an insecure foundation, and of ugly possibilities of seepage under the dam. It is more than probable that such impressions would be removed by more exact knowledge of the facts, for it is not to be supposed that the engineers would willingly take such serious risks.

The embankment consists of gravel on the lower side and of fine selected material, rolled, on the upper side. The gravel is of a consistency which will not slough under saturation. This is a very important point, for the dam which will allow water to drain away after seepage may stand well in spite of that seepage, and for this reason the rock filled drain, which extends along the entire length of the lower toe, and which is connected to the drains in the bank, is to the good. The fine material forming the watertight portion of the dam is spread in 6 in. to 8 in. layers, and is rolled with a pressure of 300 lb. per square inch. It is to be noted that the material was spread before rolling, and that all rocks over 4½ in. long were picked out. Smaller rocks were left in, but were well distributed. Here, again, the English engineer will look askance at the presence of these smaller rocks in puddled clay. Also, we are told that all stumps larger than 12 in. in diameter were removed from the dam site. Apparently, the smaller stumps were not removed. Evidently the facts that the smaller stumps remained, and that the smaller rocks were allowed to form part of the puddled clay, were appreciated by the engineers and considered to be matters of minor importance; but they are none the less puzzling. It also appears that a roadway will be formed across the dam connecting two important railways, and therefore, presumably, likely to have to support heavy motor traffic. Whether the vibration caused by such traffic can be safely sustained by an earthwork dam is open to question. It is not that the earthwork structure under normal conditions would be insufficient: it is that in the event of the embankment being weakened by seepage or undermining the vibration would tend to accelerate movement. It is therefore a question of general policy whether dams should be made use of in this way.

* * *

Safety First.

The views which we ventured to express in a recent issue with regard to the "safety first" campaign for minimising the dangers to pedestrians caused by existing traffic conditions in the Metropolis are endorsed in a remarkable manner in a letter from "A Ratepayer" which appears in the columns of a contemporary. The writer points out that it is patent to anyone who chooses to watch the traffic at a dangerous crossing that a large proportion of motor-drivers consider a few blasts from their horn to be all that is requisite to secure them a passage free from accident. "No reduction of speed is made, and it is quite evident that foot passengers must get out of the way or be run over. To put it plainly, these men exhibit a brutal disregard for human life. Most motorists insure against accidents, and verdicts of manslaughter are extremely rare, which facts can but conduce to carelessness. Turning to public vehicles, it is a cause for much wonderment and reflection why motor 'buses are allowed to travel at quite twice the speed of trams when negotiating dangerous crossings and corners. Perhaps the police can explain."

In the latter part of the letter the writer makes some practical suggestions in regard to reduced lighting, which appear to us to be of the greatest interest and importance. In the first place, the present primitive method of obscuring the light from street lamps causes much unnecessary inconvenience to traffic and danger to foot passengers. Light seen from above can proceed only from the source itself, or by reflection from the ground, &c. The former can be cut off by screens, permitting no rays above the horizontal to emerge, though in view of possible refraction and diffusion by water particles in the air it would be better to reduce the angle considerably below 90 deg. The latter can be minimised by the use of a diffusing medium. Our lighting experts also seem to ignore another elementary fact—viz., that the human eye is not constructed to receive horizontal rays of light. Our streets are therefore full of vehicles bearing lamps that throw horizontal rays full into the eyes of persons coming in the opposite direction, with the result that these unfortunate people are absolutely incapable of seeing anything behind the light. Carts drawn up close to the kerb constitute the gravest danger in this respect. As a pedestrian approaches a lamp of this description his iris contracts with the glare. When he passes the lamp the ensuing gloom is accentuated by the contracted iris admitting only a minimum amount of light. If he then attempts to cross the road he is in the worst possible condition to detect advancing traffic. Yet certain public bodies hang "guard" lamps on refuges at a height level with the eye! Obviously the remedy is to require all lamps used on vehicles to have a frosted or obscured glass, so as to cast a diffused light. In fact, to secure ideal conditions in our streets at present, no direct rays should be allowed to reach the eye at all. Enough has been said to show that the securing of safety

is not to be realised by the mere expedient of training the public in motor dodging. What is required is reduced speeds coupled with the application of common sense and scientific principles to the problem of reduced lighting, which is, of course, an absolute necessity in present circumstances.

* * *

Insanitary Property at Bristol.

The tender-hearted councillor whose sympathies are exercised on behalf of defaulting property owners had a not very happy experience at the meeting of the Bristol Town Council on Monday last. Without moving a definite resolution, he formally called attention to the large number of closing and other orders made by the Health Committee under the Housing Acts since the commencement of the war, the inability of tenants of houses so closed to obtain other houses, and the present difficulty and expense of effecting repairs. It is only fair to admit that the case of the tenants was argued with a certain amount of plausibility, but the burden of the councillor's tale was undoubtedly the difficulty owners had in getting repairs executed owing to the shortage of labour and the high prices of materials. These difficulties were no doubt genuine and considerable, but it did not appear that the Health Committee had committed the blunder of altogether overlooking them. It was explained that during the twenty-eight months of the war 187 closing orders had been issued, and that eighty of these related to void or derelict premises. Forty-one of the cases had been determined, the houses having been put into decent condition, and thirty-four of the orders had resulted in demolition. The plea for the suffering tenants, in so far as this related to disturbance, broke down completely, for it was explained that in the instances of thirty-six closing orders the tenants were still in occupation. This was described by Dr. Colston Wintle as an example of "long-suffering" on the part of the Health Committee, but it may be questioned whether the suffering does not also apply to the lot of the unfortunate people who are inhabiting these unwholesome dwellings. The Health Committee have, as a matter of fact, stayed their hands to an appreciable extent in so far as the issue of notices to repair are concerned, this clemency being due to a recognition on their part of the scarcity alike of materials and labour, as well as the difficulties of borrowing money. But, while such consideration is doubtless necessary in the circumstances, it is at the same time desirable not to play into the hands of defaulting property owners in too full a measure. The ruling of the town clerk on this occasion was a stern reminder that the position of the public authority in reference to insanitary property is defined by its absolute responsibility to the law. Replying to a proposal by the councillor who raised the subject that the Health Committee should be instructed to stop the issue of closing orders or orders to do repairs till six months after the war, he stated that the city council could not pass a resolution prohibiting itself from carrying out duties cast upon it by Act of Parliament. In any case, it was by no means probable that the city council would have entertained such a stultifying proposition, except to treat it with ridicule.

* * *

Employment of Discharged Soldiers.

A problem of immediate and pressing necessity arising out of the war is that of finding suitable employment for men discharged from the Army as partially disabled, and who, although no longer fit for the hardship and exposure of military life, are nevertheless capable of doing certain classes of civil work. One kind of work which is peculiarly suitable for such men is that of motor driving, or acting as conductors on tramways, and we observe with satisfaction that a number of discharged soldiers have already been taken on by the Leeds Corporation Tramways Committee for employment in this capacity. Work of this kind, however, naturally takes a little while to learn, and certain members of a body known as the Leeds Trades and Labour Council are apparently angry because the men are not paid during the week or so that is necessarily spent in training. At a recent meeting one member spoke of the "brutal action" of the committee in requiring men who have been disabled in fighting their country's battles, and who are now discharged, to work from six to twelve days without remuneration, while another described the department as having been "inhuman enough" to ask him to work for ten days for nothing while he learned the job. One would hardly imagine from this kind of talk that it has been the usual practice of the committee not to pay prospective employees for the few days necessary for learning the work. It is, of course, open to the Trades and Labour Council, or any other body to object to this system, and to seek by all legitimate means to secure its abolition if they do so object. But the attempt to make a discharged soldiers' grievance out of it is obviously insincere and much to be regretted; and it is not in this spirit that after-war problems will be worked out in the national interest. It is, however, satisfactory to record that the opinions extended were those of individuals, and that they were not endorsed—nor repudiated—by the council as a whole.

* * *

Institution of Municipal Engineers.

A programme of considerable interest has been arranged for the eighth annual meeting of the Institution of Municipal Engineers, which is to be held in London to-morrow. Mr. Henry Adams, M.INST.C.E., will give up the office of president of the institution, which he has held with such distinction during the past year, and he will be succeeded by Mr. Edward Whitwell, the engineer and surveyor to the Abersychan Urban District Council. In addition to hearing Mr. Whitwell's inaugural address on assuming the presidency of the institution, the members will have an opportunity of discussing three papers. The first is entitled "A Résumé of Public Health Matters," and will be read by Mr. G. Belson Chilvers; the next, presented by Mr. George Rodley, deals with "Practical Road Work;" while Mr. Horace Boot, a past-president, takes as his subject "Notes on the Use of Electricity in Municipal Engineering." These subjects are all of special interest at the present time. It is well known that a great war is invariably followed by a period of special anxiety in regard to public health matters, while the present struggle has raised problems of highway construction and maintenance of extraordinary difficulty. There should thus be plenty to interest the members attending the meeting, in spite of the fact that the usual round of visits will not take place.

"THE SURVEYOR" SPECIAL ISSUE.

The Special Annual Issue of "The Surveyor" will be published on January 26th, and readers who propose to accede to our request for a short statement, for inclusion in the number, of the works projected by their authorities for 1917, will greatly oblige by making their return as early as possible. All other material, and particularly matter accompanied by illustrations, should likewise be forwarded without delay to ensure its appearance.

A New Type of Trickling Filter.

By Lieut.-Col. G. G. NASMITH, C.M.G., PH.D., Director of Laboratories, Department of Public Health, Toronto, Canada.

[Reproduced, by kind permission, from the Journal of the Royal Sanitary Institute for December (Vol. xxxvii., Part 4).]

The object of every method of sewage disposal is to preserve the complicated putrescible organic materials present in the sewage, by converting them into simpler, less easily inorganic, compounds which are no longer decomposable, and incapable of causing offence. In other words, it is to create a harmless and non-putrescible effluent. Such an effluent is commonly said to be "purified."

Methods such as that of the septic tank fail, because, working in the absence of oxygen, they only partially split organic material, and these products of hydrolytic action have still to undergo further destructive processes in the presence of oxygen before they become stable.

Sewage disposal in the ordinary sense of the term resolves itself in chemical terms to the formula—Organic matter + oxygen = inorganic matter + humus (a stable organic material).

The aim of every method of sewage disposal has been to take advantage of the oxidising properties of living micro-organisms. Methods which have failed are those which have not provided the necessary conditions, that is, a sufficiently large mass of aerobic micro-organisms, properly harnessed to work in the presence of an abundant supply of air.

Without going into detail, it has been established beyond question that the only methods of sewage treatment which fulfil the above conditions are the trickling filter and the more recent activated sludge method.

The trickling filter requires specially prepared bacteria beds, several feet in depth, made of stone, slag, coke, or other resistant material, as a nidus for the bacterial growth. Sewage, when sprinkled or sprayed over the surfaces of such beds, slowly trickles over the pieces of stone until it finally reaches the bottom. In the course of a few weeks the pieces of stone become coated with a pellicle of slime, which has been shown to consist principally of bacteria and protozoa. It is this living slime which, in the presence of the oxygen of the air, oxidises organic matter.

From the sewage slowly trickling over the surface of this bacterial slime the organic matter is abstracted and decomposed into simpler products. These simpler products are chiefly nitrites, nitrates, carbon dioxide, sulphates, and a brownish-black non-putrescible material, easily sedimented, called humus.

If air is excluded from such beds, the oxidising action ceases, or if antiseptics are added in sufficient quantity to destroy the bacterial slime, the oxidising action also ceases.

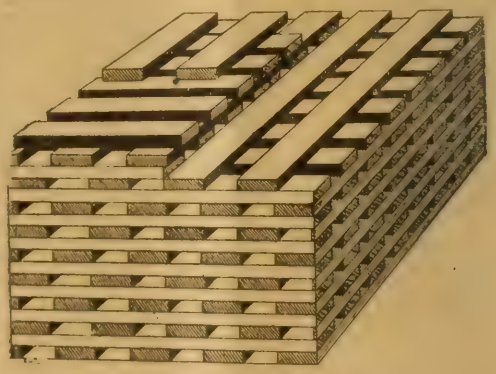
In the activated sludge method of sewage disposal a similar bacterial mass is gradually formed by blowing finely divided air through tanks filled with sewage. The sludge which forms by this treatment is allowed to settle, the supernatant fluid allowed to run off, and the tank again filled with sewage, after which the aeration is resumed. By degrees the sludge which accumulates acquires the same properties as the slime coating the filter beds. When fully matured this activated sludge will oxidise the organic matter in fresh sewage in from two to four hours when agitated continuously with it in presence of finely divided air, a perfectly clear and stable effluent is obtained.

The two methods briefly described above are practically identical in principle. In the trickling filter the sewage trickles over the bacterial mass in an atmosphere of air. In the activated sludge method the bacterial mass and sewage are kept in intimate contact by agitation with streams of fine air-bubbles. The end results are exactly the same. Furthermore, as in the trickling filter, the vast majority of the bacteria present in the sewage, including lactose fermenters, and also presumably the pathogenic varieties, are destroyed. . . .

In 1912 in an endeavour to devise a method for the disposal of the city of Toronto's sewage and reduce the estimated cost of the filter beds, I began experiments with a view to increase the efficiency of the trickling bed, always keeping the principles involved in mind. It was found that by the employment of screens or lattice work there could be increased in a given volume of space the surface area of the filtering material, and then a greater quantity of sewage could be passed over it and oxidised in a given time.

Experiments were therefore designed with the object of increasing the surface of the filter per cubic yard, and of allowing freer circulation of air than the ordinary types of filter-beds permitted. Wood was selected as the material lending itself best to the problem, and the first filter, 6 ft. square, was made of laths. The laths of the lowest layer were laid parallel to one another, the spaces between the laths being a little less than the width of the laths themselves. A second layer was laid on top of this and at right angles to it, with the same interspace. A third row was laid parallel to the bottom row, but in such a manner that the laths covered the spaces left between the laths of the lower series. In this way a filter 4 ft. in depth was constructed, in which the sewage, in order to reach the bottom, had to flow over a very large surface of filter. Air could enter from all sides and the top through the regular channels provided; in fact, one can see right through this filter, so uniformly regular are the spaces.

Sedimented city sewage was allowed to trickle over the surface of this lath-filter; in less than a month the filter was mature, and the results obtained thereafter exceeded all expectations. Where the standard type of stone filter, operated side by side with it as a control, treated 2,000,000 gallons of sewage per acre per day, the lath-filter treated 6,000,000 gallons and yielded a non-putrescible effluent. This lath-filter has now been in continuous use for three and a-half years, and has never failed to give satisfactory results.



From these results we argued that poles might give an even greater surface per unit of volume, because the poles would only come into contact along very narrow surfaces when built into a filter like the laths. Two such filters were built, each 6 ft. square and 6 ft. in depth; after maturing they yielded practically the same results as the lath-filter. They were, however, very difficult to construct; it was difficult also to obain an even distribution of the sewage flow, and short circuiting of the flow was also liable to occur. This form was abandoned as not being of practical value. One pole-filter, however, was installed in 1914 at the City of Toronto Industrial Farm to treat the sewage from several hundreds of people. No provision had been made for the fact that sewage in small communities frequently comes in gushes, and consequently, as the bed was overdosed at some periods and had no work to do at others, the results were not satisfactory. These defects have recently been remedied.

A filter built of slabs of wood was discarded, as it was only capable of treating sewage at the rate of 3,500,000 gallons per acre per day.

Finally, having proved our theory to be correct, and having made some preliminary experiments, it was decided that brushwood, pressed into bundles, would make the ideal filter for filter-beds, because it would provide the combination of a very large surface area and presence of air which is so essential.

When the town of North Toronto was annexed to the City of Toronto a few years ago it had a system of sewage disposal, part of which consisted of three trickling stone filters, each 30 ft. in diameter. In the early spring of 1914 we had the stone removed from one of these filters. Bundles of brushwood, cut from the woods near by, were made on the spot by means of a rough box-press, wired together, and placed in the filter until a depth of 4 ft. had been obtained. A space of 1 ft. was left between the brush-bundles and the wall, and a small space in the centre so as to allow air to enter freely from the sides. The old revolving distributing sprinkler was then put into operation, the brush quickly became matured, and in two months it was treating sewage at the rate of 6,000,000 gallons per acre per day. A very high degree of nitrification has been obtained; the effluent has been uniformly stable; and the installation has proved to be a decided success. This brush-filter has now been in operation for two years, and has worked just as well in winter as in summer. Of course, it is always necessary to cover filters of every description in winter in Canada to prevent freezing. A brush-filter that was operated in the open to prove whether this would occur in the Toronto climate rapidly froze solid.

After three and a-half years the lath-filter shows no signs of incipient decay, confirming the common experience that wood which is kept constantly wet does not decay. In both the lath and the brush filter the wood is covered with slime, so that the wood is always soaked.

The advantages of the brush-filter may be summarised as follows: (1) Brush is cheap, and may be obtained almost anywhere; (2) skilled labour is not required in construction; (3) it does not sludge; the slime will frequently become quite thin after heavy rains, when the sewage is diluted, though the efficiency of the filter is unimpaired; (4) the brush may at any time be removed and burned; (5) it is durable—a filter has now been in operation for over two years without showing any signs of decay; (6) the distribution of the sewage over the surface of the filter does not need to be very uniform; the general tendency is to redistribute itself in the filter meshwork; (7) it gives the maximum amount of surface, with a freer circulation of air in a unit volume of space; (8) it has proved to be a success when treating the sedimented sewage of a city on a large scale, and has treated three times as much sewage to the acre as the standard stone filter will treat.

Unfortunately, on account of the war, I have not been able to give in detail the results which have been and are still being obtained since the filters were put into operation. This brief summary is being given in order that others may avail themselves of our experience. Patents were applied for in the year 1914, in order to protect the City of Toronto until such times as our experiments should be completed. No rights or royalties are claimed, however, in connection with the process. In fact, it is hoped that the cheapness of the system will enable communities to instal systems of sewage disposal in districts where the high cost of the accepted types of installation have been prohibitive in price. In the prairie provinces of Canada, for example, where stone would in many cases have to be hauled by train for hundreds of miles, and costs a great deal, the brush-filter should solve the problem in regard to expense of installation.

In conclusion, I wish to express my great appreciation of the work of my assistants, Mr. J. Scott, chemical engineer, who has carried out the construction of, and has been responsible for the operation of all the experimental filters, as well as the chemical analyses in connection therewith, and Dr. F. Adams, D.P.H., who has supervised this work in my absence. I am also greatly indebted to Mr. R. C. Harris, Commissioner of Works, and to Mr. Worthington, engineer-in-charge of the sewage system, through the unfailing co-operation and interest of both of whom it has been possible to carry out the experiments on a large and practical scale.

The Price of Victory.—Penge Urban District Council were engaged recently in a law case over the Croydon-road public lavatory, in which they were successful, but in spite of this the bill of costs incurred amounted to £537, which was duly passed upon the recommendation of the Finance Committee. One member described the bill as a bomb-shell, but it was explained that the clerk had acted on the instructions of the council. He had to engage an expensive counsel because the other side had a K.C.

FOOD PRODUCTION IN WAR-TIME.

LOCAL AUTHORITIES AND THE CULTIVATION OF SURPLUS LAND.

In connection with the Government scheme for increasing food production in Ireland, the Secretary of the Local Government Board has issued a letter to every urban council in Ireland stating that, with a view to increasing the area of land under cultivation in Ireland, His Majesty's Government had resolved upon means which would enable urban district councils to take by agreement land for the purpose of letting it in allotments to workmen resident in the district who were not in occupation of land, and who were willing to undertake the cultivation of potatoes and oats. Arrangements are also being made for loans for the purchase of seed potatoes and oats.

AMPTHILL U.D.C.—A letter was received at the last meeting from Mr. C. P. Hall stating that the Duke of Bedford was prepared to offer the council about 100 acres in whole or in part at the Warren Farm, Millbrook. This land has been unoccupied for several years, but excellent potatoes and vegetables had been grown on some portions during the past season. A similar offer was being made to the rural district council, and it might be possible, in view of that authority wishing to take some land, to divide the area and meet the wishes of each council as far as possible. Members felt that it was an important matter, and it was left to a committee with executive powers.

BLACKBURN T.C.—The corporation have in hand the securing of suitable plots of land for cultivation. The land at Roe Lee, given by Messrs. J. Duckworth and J. R. Eddelston for a park, will be cultivated under the scheme; and the committee have visited the corporation and Queen's Parks with a view to selecting suitable plots. The committee will break up the land in the first instance, and will, if possible, provide seed, manure, and implements at cost price to the cultivators. The committee will also arrange for expert assistance to be given in the preparation and cultivation of the allotments.

HULL T.C.—The Parks Committee have decided to bring into cultivation for potatoes, oats, and wheat 67 acres of corporation land. Unfit soldier labour was suggested, and a councillor offered to lend the necessary ploughs.

LLANDUDNO U.D.C.—The chairman of the Finance Committee, Mr. R. Roberts, stated at the council meeting recently that his committee were moving energetically in the matter of providing land for producing food, and Lord Mostyn, the principal landowner, had stated that he would give all possible assistance in the movement.

ST. IVES T.C.—Many applications have been received for plots of land for food-growing, and these have been referred to the General Purposes Committee, which is dealing with the matter.

SHREWSBURY T.C.—Alderman Deakin stated at the council meeting on Monday that the Improvement Committee had inspected various plots of land and were prepared to make certain recommendations. The number of applications received for allotments up to the present time was seventy-two. It was proposed to grow a considerable quantity of potatoes on the sewage farm, and to use the land acquired for the extension of the cemetery for the same purpose.

WALMER U.D.C.—It has been decided to devote the public recreation ground to the growing of potatoes and other vegetables during the war. The ground will be let to applicants free of all rent on the sole condition that it is used to the best advantage for producing food.

WOKING U.D.C.—The council are sowing with wheat land acquired for a housing scheme, and intend to prepare for cultivation next spring part of the public recreation ground.

Road Work for War Prisoners in Essex.—It was reported at the last meeting of the Essex County Council that the War Office had been asked to arrange for the employment of German prisoners of war in repairing Essex main roads. All the surveyor's staff of military age have been released for road making behind the British lines in France, and ten steam rollers have been lent for the same purpose.

ACTIVATED-SLUDGE EXPERIMENTS.*

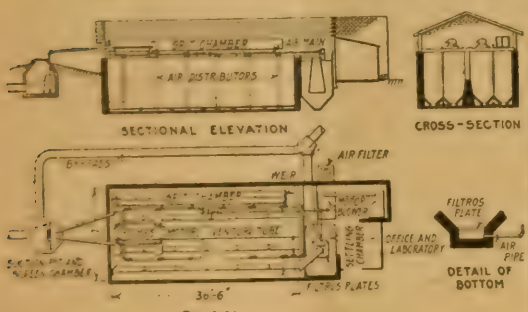
By Edward Barrow F. W. Mohlman and J. F. Schnellbach.
Illinois State Water Survey.

The first series of activated sludge experiments at the University of Illinois began November 1, 1914, was carried out in 3-gallon bottles. The second series was conducted in a tank 7 ft. square and 4½ ft. deep. The third series was conducted in four tanks each having an area of 10 sq. ft. and a depth of 9 ft. Experiments in the first three series were carried on by the fill and draw plan. At present, for the fourth series, a continuous-flow plant is being successfully operated. This series is conducted in the septic tank designed by Prof. A. N. Talbot in 1897 for the city of Champaign. Early in 1916 this tank was placed at the disposal of the State Water Survey, and was reconstructed with the expectation that 200,000 gallons of domestic sewage be treated daily.

design of plant.

The plant (see accompanying illustration) contains a screen chamber and pump pit, a grit chamber, an aeration chamber, a settling chamber, a blower-room, and a laboratory. A sludge-drying bed and a pond into which the effluent from the process may be discharged are also provided. Plans have been made for the installation of sludge-drying apparatus.

The sewage is drawn from the main outlet sewer of the city of Champaign. The daily flow is from 1,000,000 to 1,500,000 gallons. The manhole nearest the septic tank was modified to serve as a screen chamber and suction pit for the pumps. A weir was placed in the outlet to raise the sewage level and



provide suction for the pumps. Vertical bars spaced with ¾-in. openings prevent coarse material from reaching the suction of the pumps. The sewage is pumped to a grit chamber by two centrifugal pumps, one with a capacity of 75 gallons and the other of 110 gallons per minute. Each pump is belt-connected to a 3-h.p. electric motor. The grit chamber is 34 ft. long, having two compartments each 1 ft. wide. At the outlet is an adjustable weir through which the sewage must flow and where its rate can be measured.

The sewage flows from the grit chamber into the aeration chamber, a rectangular concrete tank 17 ft. by 30½ ft. in plan and 9½ ft. deep, having a capacity, after allowances are made for the baffle walls and the sloping bottoms, of about 36,000 gallons. The chamber is divided longitudinally by three baffles into four compartments through which the sewage travels a distance of about 140 ft. The lower part of each compartment has sides sloping toward the centre to a channel 12½ in. wide and 4 in. deep, extending lengthwise through the tank. Above this channel filtros plates are supported on T-bars that have been embedded in the concrete. The channel below the filtros plates was divided into sections for the filtros plates with the expectation that each set of plates would be separated from all the others, and that the supply of the air to the plates could be controlled by an air pipe and valve for each set. Owing to the tapering of the sloping concrete sides it has been found impossible to regulate independently each set of plates. The aeration tank should be capable of treating 144,000 gallons of sewage and sludge per day if aerated during a period of six hours; 576,000 gallons if aerated four hours, 216,000 gallons if aerated two hours.

The aerated sewage and sludge flows from the aeration chamber to the settling chamber. The settling chamber is 6 ft. by 10½ ft. in plan and 10½ ft. deep at the lowest point. It has a capacity of 3,700 gallons. This would give a retention period of twenty-four minutes, thirty-one minutes, and thirty-seven minutes, with a flow of four hours, five hours and six hours respectively, through the aeration chamber.

In order to assist the settling of the sludge, the liquid is passed down through the centre and up around the edges of a hollow wooden pyramid placed in the centre of the settling basin. The pyramid is 15 in. square at the top, 3 ft. square at the bottom, and extends to within 3½ ft. of the bottom of the chamber.

From the settling tank the effluent flows over a weir to the creek or into the pond. The pond is formed by two dams placed across the abandoned bed of a small stream. It covers about 0·1 acre, and is 3 ft. deep in the deepest part.

The sludge is withdrawn from the settling chamber by an air lift, and can be discharged into the raw sewage, where it enters the aëration chamber, or can be diverted for experimental purposes, or to the sewer. Some sludge has been dried on a sand bed having an area of 256 sq. ft. and a depth of 8 in. The drying of sludge on the sand bed is not considered a success.

Air is supplied for aëration and for the air-lift by a rotary positive-pressure blower having a rated capacity of 300 cub. ft. per minute, driven by a 15-h.p. electric motor. The air is filtered through cheese-cloth spread over a wire box before it enters the blower suction pipe. The air is measured through a Venturi meter.

performance of plant.

The plant has been in continuous operation for twelve weeks (on October 4, 1916), prior to which time it was operated intermittently for periods of from one to three weeks. No special effort was necessary to build up activated sludge. The plant has simply been put into operation, allowing the effluent from the settling chamber to escape while pumping back the sediment. From the start 90 per cent of the suspended matter was removed, and after thirteen days of operation stable effluents were obtained.

The results achieved have been very gratifying. Purification is indicated by the presence of from 5 to 8 parts per 1,000,000 of dissolved oxygen and the stability to methylene blue of from five to fifteen days. The effluent is odourless and generally clear, though at times, because of the insufficient capacity of the settling chamber, it contains small particles of sludge.

The plant has been run to obtain a clear effluent. Owing to the insufficient size of the settling chamber the actual rate of operation has been less than one-half of its rated capacity. Additional settling chambers are to be installed.

After satisfying ourselves that the plant could be run satisfactorily at a rate suitable to the capacity of the settling chamber, the rate has been increased to 150,000 gallons per day, even though some sludge escapes with the effluent. At this increased rate, using 2 cub. ft. of air per gallon of sewage, stable effluents have usually been obtained. Owing to the presence of sludge in the effluent, the effluent was allowed to settle in glass cylinders 30 minutes longer before taking samples for analysis.

* From *Engineering News*.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Elgin Tar-spraying Costs.—The burgh surveyor, Mr. A. A. Turriff, reports that the area of roadways in Elgin tar-sprayed during last year amounted to 79,767 super. yds., at a cost of £462 14s. 2d., or 1·39d. per super. yard, as against ·63d. in 1915 and ·58d. the year previous.

A Good Roads Train.—In the report of the United States Office of Public Roads and Rural Engineering for the year ended June last, the interesting statement is made that a "good roads" train, equipped by the department with a complete set of road models and photographs, and including a lecture car provided with stereopticon and cinematograph equipment, was operated throughout the State of Iowa. Stops were made at 131 towns and cities, and 200 lectures and demonstrations of models were made during these tours. The total attendance at the lectures and demonstrations was 22,000.

New York City Water Supply.

THE CATSKILL MOUNTAINS SCHEME.

By W. J. E. BINNIE, B.A., M.INST.C.E., F.G.S.

[Mr. Binnie was on Wednesday evening installed as president of the Institution of Sanitary Engineers in succession to Mr. A. P. I. Cotterell, M.INST.C.E., and delivered a long and interesting address on the subject of Waterworks Engineering, dealing first with the water supply works of Ancient Rome, and turning to the greatest undertaking of modern times the Water Supply of New York from the Catskill Mountains.]

Before commencing this gigantic work preliminary investigations were undertaken by means of boreholes on a scale which was truly colossal, and by 1910 the length of core boring and pits for trial purposes aggregated nearly 33 miles, so that for every mile of the aqueduct there was over ¼ mile in depth of boring and trial pits.

As an example of the magnitude of some of this preliminary work, I cannot do better than refer to the boreholes at the proposed crossing under the river Hudson. It was decided to cross the Hudson at Storm King, and at the point of crossing the hydraulic gradient would be 400 ft. above the level of the river, which at that point was over ½ mile wide. The Hudson now flows in a valley filled with water-borne deposits of sand, gravel, boulders, clay and silt, the maximum depth of water in the river at the point of crossing being about 100 ft., and it was known that the rock in which the old river had eroded a channel was overlain by a great depth of these deposits.

THE HUDSON RIVER CROSSING.

There were four possible methods of crossing—(1) by a bridge 150 ft. or more above high-water level to carry steel pipes; (2) steel or iron pipes laid in trenches dredged in the river bottom; (3) shield-driven tunnels under compressed air at a depth not greater than 100 ft. below water level, steel lined or containing pipes; (4) a pressure tunnel deep in sound rock.

Of the four methods the pressure tunnel—*i.e.*, a tunnel designed to carry water under pressure—would be the cheapest and most durable, and the problem to be solved was the location of the surface of the rock, as, owing to the internal water pressure to which the tunnel would be subjected, it was necessary to be deep in sound rock. Borings were started from barges in the ordinary way, but the difficulties proved almost insuperable, owing to the swift currents, heavy traffic on the river, short working season, and the great depth at which the rock lay, so that after four years of drilling only six holes reached the rock below the river channel. The borehole near the centre of the channel did not meet rock, and was abandoned at a depth of 768 ft.

It was early realised that vertical borings would only give inconclusive evidence as to the rock profile under the Hudson River, and the drilling proved so slow that it was evident that enough boreholes could not be put down in time to give even a fair estimate of the depth of sound rock underlying the river. Two shafts were therefore sunk, one on each side of the river, to a depth of 1,100 ft., chambers being formed in the sides of these shafts at a depth of about 250 ft. below the surface, and inclined boreholes were started from these chambers, which were to cross each other under the river and so determine whether solid rock was continuous.

The first two boreholes were driven at such an inclination as to cross each other at a depth of about 1,500 ft. below the surface. They were commenced in 1909, and the borehole from the east shaft, which was 1,834 ft. long, took seven months to complete, that from the west shaft, which was 2,052 ft. long, taking eight months, both boreholes being completed by March, 1910. These holes, which were bored by diamond drills, were commenced 4 in. in diameter, and gradually decreased to 1⅞ in.; 55 per cent of the core was recovered from the bore at the east and about 66 per cent was recovered from that at the west shaft.

These boreholes showed that solid rock existed right under the Hudson at that depth, and two further boreholes were then commenced, which were completed in August, 1910, after four months' work. These boreholes were inclined at an angle of about 23 degrees to the horizontal, and intersected each other at a depth of about 960 ft. below the surface, the length of each being about 1,620 ft.

The core recovered amounted to about 70 per cent, and the fact was established that if the tunnel was driven at a level of 1,100 ft. below the surface it would lie deep in solid rock, and therefore this was fixed as the level of the tunnel below the river.

The cost of these boreholes was about £12,000, and it was felt that the money was well spent, as previous experience with the Croton Aqueduct showed the necessity of ascertaining the nature of the strata beforehand, as a considerable length of tunnel under the Haarlem River had to be abandoned and reconstructed at a lower level owing to a deep channel in the rock, which was only discovered when reached by the tunnel.

THE ASHOKAN RESERVOIR.

Turning now from preliminary investigation to the actual scheme as it was carried out, a gigantic reservoir, called the Ashokan reservoir, was constructed primarily to store the waters of the Esopus and Beaver Kill, the former river being impounded by the Olive Bridge masonry dam, the latter by means of embankment.

The Esopus watershed is 245 square miles in area and the Beaver Kill 17 square miles, and these drainage areas are estimated to yield 250,000,000 gallons per diem. In addition to the Esopus and Beaver Kill, three other sources can be made contributory to the scheme—the Rondout, estimated to yield 115,000,000 gallons per diem; the Schoharie, estimated to yield 136,000,000 gallons per diem; and various drainage areas situated in the Catskill Mountains, estimated to yield 149,000,000 gallons; giving a gross total of 660,000,000 gallons per diem. The Ashokan reservoir can make provision for part of the yield of the Schoharie and Catskill watershed, which are not yet made contributory to the scheme.

The total storage provided by this reservoir is 130,000,000,000 gallons, or ten times the quantity which can be stored in the Vyrnwy reservoir of the Liverpool Corporation, the largest artificial reservoir yet constructed in this country, and as the aqueduct is designed to discharge 500,000,000 gallons a day, the reservoir capacity is 254 days' supply of the discharging capacity of the aqueduct.

New York already has two sources of supply, the Croton and the Bronx, which are estimated as being capable of yielding about 400,000,000 gallons per diem, so that with the additional supply afforded by the Catskill scheme, New York will have a supply amounting to approximately 900,000,000 gallons per diem. Some idea of what this means can be realised when it is remembered that the average natural flow of the Thames at Teddington Weir is 1,100,000,000 gallons per diem. The population of Greater New York is about the same as that of Greater London, but New York requires 100 gallons per head of population per diem, whereas London is content to put up with less than forty; consequently the total quantity supplied to London is only about 250,000,000 gallons per diem.

A GIGANTIC MASONRY DAM.

The sheet of water formed by the reservoir is over 11 miles long, and the maximum breadth is over 2 miles, the water area when the reservoir is full being about 16 square miles. The total length of masonry structures and embankments which were necessary to impound the water is over 5½ miles, but the length of masonry included in the above is only 3,100 ft., the remainder being embankment. The Olive Bridge masonry dam closes the Esopus gorge, the water impounded having a maximum depth of 190 ft. We have no masonry dams in this country to compare with it, as the Penygarrig dam of the Birmingham Corporation, the highest yet constructed, only impounds a maximum depth of 125 ft. of water. The structure has a length of only 1,000 ft., and the masonry above ground level is broken up into divisions by means of vertical joints—spaced 80 ft. to 90 ft. apart to prevent cracks through the face due to changes of temperature. The masonry at the expansion joint is a

formed that the two abutting sections of the dam interlock by means of tongues and grooves, and a vertical inspection well placed about 18 ft. to 20 ft. from the water face traverses the joint, affording the means of inspection and also of closing the joint if leakage should prove excessive. The vertical wells discharge into a longitudinal culvert, which communicates with a gallery discharging into the gorge below the dam. Another longitudinal gallery connects the wells at about top water level.

In addition to these inspection wells, 16-in. diameter vertical holes are left in the dam, spaced about 12 ft. apart, and surrounded by concrete so formed that any water which finds its way into the masonry would be intercepted and led away. These arrangements were made in order to prevent the uplifting effect of the water, which is bound to occur if it penetrates a horizontal crack or fissure in the dam. Novelty is claimed for this method of construction, but, as a matter of fact, the late Dr. Deacon provided similar joints more than twenty years ago when designing the Upper Neuadd dam for the Merthyr Tydfil Corporation, except that in that case asphalt was used at the joint to prevent leakage, and there were no vertical inspection wells.

The Olive Bridge dam is founded on hard bluestone rock, and the excavation was only carried to a moderate depth below stream bottom. It is of ordinary section, the total height above the stream level being 210 ft., and the maximum thickness at the base 180 ft. It carries a roadway 20 ft. above overflow level, and flood water escapes from the reservoir by means of a waste weir 1,000 ft. in length, which is located elsewhere. It was built of Cyclopeian masonry in the ordinary manner—i.e., large blocks of irregular-shaped stone bedded in concrete, and was faced with moulded concrete blocks.

EMBANKMENT CONSTRUCTION.

The several embankments required to fill up other valleys and gorges before water could be impounded in the reservoir follow the usual American practice in construction, which differs somewhat from that obtaining in this country. In order to prevent water from leaking either through or under an embankment, longitudinal core walls or watertight diaphragms are introduced traversing the centre of the embankment, which walls are carried down to the solid rock or an impermeable stratum, and in this country puddle clay is the material employed for the construction above ground, the cut-off trench below ground being generally filled with concrete. American engineers employ concrete for the core wall both above and below ground, and all the embankments of the Ashokan reservoir are so provided.

The reason for avoiding the use of concrete above ground in this country is because cracks in the concrete, due to changes of temperature or other causes, are to be anticipated, and water would tend to find its way through these cracks, whereas clay puddle, if kept moist, does not crack. Puddle, however, if it is to prevent percolation, must be good throughout, as the water will find the weak spot, and once erosion starts the embankment is doomed unless the reservoir can be emptied in time to prevent disaster. Concrete, on the other hand, does not erode, and therefore any leakage through any small cracks tend to become blocked up by means of the embankment material carried into the crack by the water. The maximum height of the embankment was at the Beaver Kill Gorge, where the top was 115 ft. above the bed of the stream, the foundations of the core wall going down to a depth of about 70 ft. below the ground surface.

The reservoir is divided into two basins by means of a weir about 100 ft. long and an embankment, the weir serving the purpose of passing overflow from one division to the other. The intake chamber is situated in the bank, with inlets from each basin, and two culverts, one over the other, are placed in a trench below the bank for conveying the water to the aqueduct, and two channels had to be excavated leading to the intake chamber, one in the east and the other in the west basin, for a total length of 8,800 ft. and a maximum depth of 80 ft., in order to allow of the water level being drawn down in the reservoir.

Considerable difference of opinion existed as to the advisability of stripping all vegetable soil from the site of the reservoir before impounding. It was finally held that aëration and filtration would probably be required to obtain a satisfactory water, and that therefore the cost of stripping, which amounted to £1,000,000 sterling, was to be avoided, seeing that it would have no beneficial effect if the water was aerated and filtered. The reservoir site was not stripped, and spiral aërator nozzles were designed to fountain the water into thin fins through the air before it entered the aqueduct, but hitherto filters have not been provided.

The outlet from the reservoir is so arranged that the water can be passed through the aërators or not, as desired, and before entering the aqueduct it passes through a gigantic Venturi meter, so that its quantity can be measured. The Venturi meter is constructed of reinforced concrete, with the exception of the throat and measuring ring castings, its total length being 400 ft., the waterway changing gradually from the normal aqueduct section to a circular bronze throat casting 7 ft. 9 in. internal diameter, the pressure tubes being connected one to the throat casting and the other to another circular bronze casting 17 ft. 6 in. in diameter, situated 30 ft. at the upstream side of the throat. The Venturi throat is depressed so that it is under a head of 25 ft., the ratio of contraction being about 5 to 1. Three other Venturi meters and several gauge chambers are provided at various points along the line of aqueduct, so that the amount of leakage between different points can be readily determined. The outlet pressure culverts terminate in a battery of 48-in. pipes, provided with special non-chattering valves, and the ordinary regulation of flow is by means of these valves, an overflow weir 100 ft. long providing for the escape of water should flow decrease in the aqueduct before the corresponding regulation of the valves can take place.

As the water level in the reservoir would generally stand much above that in the aqueduct, turbine machinery has been introduced for the purpose of utilising the head available for the production of electricity to give light and power for local service.

Some idea of the magnitude of the headworks can be gathered from the following figures: The work was let in several contracts, the chief of which covered 2,500,000 cub. yds. of excavation, 7,500,000 cub. yds. of embankment, and nearly 1,000,000 cub. yds. of masonry construction.

126-MILE AQUEDUCT.

Having now given a description of the headworks, I must pass on to the aqueduct and deal with it somewhat more briefly, as I fear that I have already somewhat exhausted your patience. The total length of the aqueduct from the Ashokan Reservoir to Silver Lake reservoir is about 126 miles, and the average fall about 2 ft. per mile. It is full sized until the 111th mile is reached, being at this point under New York City, where it commences to diminish in steps as water is taken off till it enters the Silver Lake reservoir as a 48-in. cast-iron pipe.

The chief feature of novelty, as far as English practice is concerned, is in the extensive use of pressure tunnels in lieu of pipe syphons. These tunnels are sometimes subjected to enormous pressure, the one constructed under the Hudson, already referred to, having to withstand an internal pressure due to a head of 1,500 ft. of water, which is equal to an actual crushing strain on the concrete lining of over 40 tons to the square foot, and, as the internal diameter of the tunnel is 14 ft., and the thickness of the concrete only averages 17 in., the tension in the concrete, if there was no external pressure to resist it, would amount to 200 tons to the square foot. These figures show how absolutely necessary it was that the tunnel should be driven in solid rock at a sufficient depth, and explain why such careful preliminary investigation was essential before the work was put in hand.

Some difficulty was experienced in driving this tunnel on account of the enormous pressure of the water which found its way in under the Hudson and rendered useless the ordinary method of grouting to seal back the water. This difficulty was successfully surmounted by special apparatus designed to inject Portland cement grout under pressure as high as 600 lb. per square inch.

The actual maximum water pressure recorded was 470 lb. per square inch, and, supposing the water-bearing seams had not been sealed up and that the water could work its way behind the lining and between it and the rock, the crushing strain thrown on the concrete would amount to 170 tons per square foot, when the syphon is empty, and it requires very good concrete indeed to stand this pressure without crushing, and considerable courage on the part of the engineering staff to design the tunnel so that there was a possibility of its being submitted to such strains.

I believe, however, that the Hudson syphon has proved satisfactory, although I see from the engineering Press that a pressure tunnel immediately adjoin-

ing it, and which was subjected to only about half the internal head, has shown signs of weakness, necessitating the abandonment of a short length of tunnel, which is being reconstructed at a lower level. This failure is attributed to local yielding of the gneiss rock in which the tunnel is driven, which allowed the concrete to be forced back under internal water pressure, causing the lining to crack, with consequent leakage of water.

The aqueduct consists in part of concrete cut and cover construction, following the hydraulic gradient, horseshoe-shaped in cross-section, and having a waterway of 241 sq. ft., or more than twice that of an ordinary tube railway tunnel. The concrete construction is covered with a bank having a width of 15 ft. and side slopes of 1 to 1¾, there being 3 ft. of cover over the crown of the aqueduct. This is the cheapest form of construction, costing a little under £12 per foot-run, and about 51 miles was built of this type.

(To be concluded.)

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ

(One man does not see everything.)
—EURIPIDES.

HOUSING AND TOWN PLANNING AFTER THE WAR.

To the Editor of THE SURVEYOR.

SIR,—I am very pleased to read some of the suggestions contained in the paper on "Housing and Town Planning After the War," by Councillor Harrison Barrow, of Birmingham, which appeared in your issue of December 29th last.

It is very desirable that new housing developments throughout the country should be on better lines than has been usual, and it is evident that the Housing and Town Planning Act, 1909, with all its good intentions, is too slow and clumsy to effect much change. Also its permissive character renders it of no use just where it, or something like it, is most needed.

The suggestion by Councillor Barrow that every town and urban district should be obliged to define the number of houses which may be erected per acre upon the land within its boundaries is simple and practical. It would allow full scope for local conditions, involve no tedious labour, and would accomplish all of practical utility that town planning in its most complicated and elaborate efflorescence could achieve.

One map, and that a 6-in. Ordnance, would be sufficient for defining zones, of which there may be three, or any other number which may be thought desirable. I see no reason to stick at three if more are better.

The numbers specified and the boundaries of the zones should be subject to revision every five years, and the numbers and zones should always be subject to Local Government approval.

If there were coupled with this the compulsory power to define building lines for all streets, then you have everything that is necessary to control development.

And you have it in a form simple to operate, easy to understand, prompt and fair in its action, and subject to popular control. No new principle (except the one of compulsion) is involved in the suggestions, they simply contain the marrow of the Housing and Town Planning Act compressed into tabloid form. No arbitrary standard would be thrust upon an unwilling community. It is simply left to each locality to work out its own salvation. But it must work.

The whole business could be put through Parliament and all the plans prepared, approved, and be operative for every town and urban district in the country inside six months.—Yours, &c.,

J. W. TOMLINSON.
Borough Engineer, Luton.

January 3, 1917.

THE DESIGN AND COST OF RESERVOIRS.

To the Editor of THE SURVEYOR.

SIR,—Having had the privilege of viewing the Cross Hill covered service reservoir during its construction, and being present at the meeting when Mr. W. J. E. Binnie, B.A.(CANTAB), M.INST.C.E., read his very able paper on the design and construction of these works, the writer considers the criticism by correspondent "Water," who finds it necessary to write under a *nom de plume*, somewhat disingenuous.

The insinuation that the engineers who are responsible for the design have not had sufficient experience in water engineering to warrant their departure from the orthodox design of service reservoirs is somewhat impressive.

To call the work "elaborate" is anything but correct.

The writer is, however, in full agreement with the remark, "somewhat unusual design," and thinks the engineers are to be congratulated on their spirit of originality; it would be a move in the right direction if more originality was put into the design of all municipal works.

With regard to the covering of the reservoir, the writer's experience fully endorses the provision made in the Cross Hill covered service reservoir, more especially as the water to be impounded will be "filtered"; serious contamination can arise with water impounded in open reservoirs, notwithstanding the site of the works might be similarly situated to the reservoir under review.

No water after being filtered and used for domestic purposes should be exposed to atmospheric conditions prior to its use.

On "Water's" own estimate the cost of the covered service reservoir justifies its adoption, as Mr. Binnie's figures, £2,625 (per 1,000,000 gallons capacity) are from actual cost, while the £2,465 is purely an estimate.—Yours, &c.,

FRED. J. DIXON, M.INST.C.E.

Town Hall Chambers,
Ashton-under-Lyne.
December 30, 1916.

ROAD SERVICE IN FRANCE.

To the Editor of THE SURVEYOR.

SIR,—Your leading article and the letters of your correspondents overlook an important aspect of the case, and that is, the possibility of filling up these commissions by men *over* military age. It will be remembered that about eighteen months ago a number of Navvy Battalions were recruited for roadwork in France, the navvies to be aged forty to forty-seven. Being over military age, I applied for a commission, but found that the age limit for officers in these battalions was fixed at thirty-five. I got in communication with the War Office at that time through our local Member of Parliament, and the reasons they gave for fixing the age limit at thirty-five were—(1) That the work was too strenuous for men over thirty-five (although they accepted navvies up to forty-eight!), and (2) that they had received sufficient applications from men under thirty-five.

I presume it did not occur to them that they could have got sufficient navvies under thirty-five as well if they had asked for them. However, now that we have got a practical man at the head of affairs in the person of Brigadier-General Maybury the age limit has been raised to fifty.

It appears to me that, under the circumstances, the first consideration should be—can these posts be filled by men *over* military age? I think it is time the venerable greybeards of the age of forty-five to fifty had a sporting chance. Of course, if sufficient of these "antediluvians" cannot be obtained, by all means give preference to men now in the Army rather than to men of military age who have not yet joined up.

One wonders how those men stand who were declared by their councils to be indispensable when required for the fighting units, and who are now being granted permission to join the Road Service battalions.—Yours, &c.,

DUG-OUT.

December 30, 1916.

Business Announcement.—We are informed that, as from December 19th last, the registered name and title of the Anglo-Mexican Petroleum Products Company, Limited, will be Anglo-Mexican Petroleum Company, Limited, the word "Products," which has hitherto formed part of the company's name, being omitted. This change has been made solely to simplify the title of the company, and involves no alteration whatever in the control organisation or operation of the business. The company will, as heretofore, continue to market the well-known products of the Mexican Eagle Oil Company, Limited including fuel oils and Diesel oils, Mexphalte and Fluxphalte for road construction, lubricating oils, paraffin wax, &c. The Anglo-Mexican Petroleum Company, Limited also import Mexican kerosenes and motor spirit which are marketed in the United Kingdom by its sales agents, the Bowring Petroleum Company, Limited, under the brand names of Snowflake, Bearcreek and Empire lamp oils, and Mex motor spirit.

LONDON'S WATER.

RESISTANCE TO FILTRATION EXPERIMENTS.

By Dr. A. C. Houston,
Director of Water Examination, Metropolitan Water Board.*

By "resistance to filtration" is meant the degree to which the living and dead suspended matters in a water interfere with its filtration. The subject is of great practical as well as of scientific importance, for several reasons. For example, the average cost of filtering water is said to be about 28s. per 1,000,000 gallons. About 20s. of this goes in interest on capital charges, leaving 8s. for working costs. The above is quite irrespective of pumping costs before or after filtration. If the pre-filtration waters contained no suspended matters, the filters, if protected from light, would practically never require to be cleaned, and on every 1,000,000 gallons filtered there would thus be a saving, theoretically, of nearly 8s., assuming it to be true that most of the 8s. is expended on cleaning operations, and putting on one side for the moment the necessity of maintaining a staff adequate to deal with all emergencies. If the suspended matters were reduced one-half, presumably nearly twice the amount of water (2,000,000 gallons) could be filtered at a like cost. This would, theoretically, mean a saving of 4s. per 1,000,000 gallons, and for less than this sum 1,000,000 gallons could be treated with an algicidal agent. It follows that when algal troubles are the cause of the filters blocking a point may be reached when the use of an algicidal agent is economically advantageous. It must, however, be remembered that these growths develop not only in the storage reservoirs, but in the water lying over the sand in the filters and in the skin itself. It should also be noted that the treatment should precede the algal development, as a water, once it has become badly affected, may continue to filter badly even after treatment with an algicide.

These calculations are admittedly based on theoretical rather than on practical considerations. The information apparently required is the cost of cleaning the filter beds under normal conditions, and the additional cost thrown on the board when the conditions are abnormal. If this extra cost could be wiped out by the use of algicidal agents at a less cost than the price of the chemicals, the matter becomes one of practical politics, assuming always the possibility of reducing the working staff correspondingly.

The suspended matters in water are living and dead. The dead materials may be organic or inorganic. Although they do not themselves undergo multiplication they may nevertheless play a part in fostering life.

The living matters (algal and other growths), on the other hand, often multiply in water to an extraordinary extent, and as many of them secrete viscous substances, their clogging effect on filters may, apart from questions of taste, become serious.

The dead matters, especially if non-colloidal, tend to settle out in the storage reservoirs, but the living ones may be free swimming, and even the sedentary forms are so easily affected by currents, &c., that they are frequently dispersed throughout the water in a reservoir.

River water contains these living growths, but usually in such relatively small numbers that, in the absence of fresh multiplication, they do not affect filtration to any great extent. It is the dead suspended matters present in excess during floods that are the chief obstacle to the filtration of river water.

Whenever river water is stored in reservoirs the living growths are liable to take on powers of multiplication, although the laws governing their vital activity are but little understood. On the whole, the factors which favour multiplication are light, pabulum, and perhaps stagnation. Hence, shallow reservoirs with dirty, muddy bottoms fed with impure, non-circulating water are apt to suffer more than deep reservoirs with clean bottoms fed with pure circulating water. But questions of temperature, dissolved gases, and many other factors play a part, and those who have had most experience of this subject are apt to be the most cautious in expressing opinions as to the cause at work.

For nearly ten years this matter has been under continual investigation, and for the last eighteen months all the pre-filtration waters (river water, canal water, stored water and mixtures) have been systematically examined.

As regards the method it is convenient to quote from page 4 of my Ninth Annual Report, as follows:—

"The principle is to filter 100 c.c. of the water through a standard piece of linen (four layers) stretched tightly over the end of a glass tube (6 mm. inside diameter) and fixed in position by means of a rubber band. The result is that all the suspended matter (algæ, &c.) in the 100 c.c. is left as a film on the inner side of the linen. The tube with attached linen is then transferred to another piece of apparatus, and tap water, under a constant head, filtered through it for exactly one minute. The filtrate is collected and its volume measured. The greater the volume the better the water is for filtration purposes, so far as the life of a filter is concerned. With a good water the result will be well over 200 c.c., but with an algal-infected water it may be less than 10 c.c."

Since July, 1915, these filtration results have been correlated with the microscopical appearances of the suspended matters by means of photographs.

Briefly, 20 c.c. of the water are centrifuged in special tubes. By appropriate means one-half of the sediment (mixed with 0·1 c.c. of water) is transferred to a small cell cemented on to a slide which is centred under the microscope, and a photograph taken. With a magnification of fifty diameters the photograph shows the suspended matter in what corresponds approximately to 0·5 c.c. of the original water (about 1/20th of the whole field), and in this way a permanent quantitative and qualitative picture of the suspended matter is obtained. Many of the pre-filtration waters show remarkable seasonal fluctuations in quality, and they differ from each other greatly as regards the way they respond to the filtration test.

*Extract from Twelfth Research Report.

MUNICIPAL SCHEMES AFTER THE WAR.

The following particulars of works which municipal authorities are proposing to undertake at the close of the war have come to hand during the present week:—

Aberavon T.C.—The projected schemes include a new cemetery and chapel; the Cwmavon-road improvement; and the laying out of a recreation ground at the beach.

Glyncorrwg U.D.C.—It is hoped to proceed with the completion of the new Avon Valley road, also with a town planning scheme, new roads and sewers, works of improved water supply, and the provision of workmen's dwellings.

Lambeth B.C. The Highways Committee have scheduled a considerable list of road repairs and renewals which have been in abeyance, and the Wharf and Cleansing Committee submit three schemes—viz., the construction of a new jetty and paving work, Providence Wharf, Albert Embankment, £10,000; the reconstruction of buildings at council's stables, Stockwell Green, £15,000; and the construction of new depot buildings and dust destructor, Rommany-road, £34,947. The Public Health Committee propose an extensive schedule of drainage improvements and reconstructions.

Merton U.D.C.—The following schemes have been scheduled: Surface-water drainage improvement scheme for north-west portion of district, £20,000; widening of Beverley Brook culvert at Blagdon-road, £100, main relief low-level sewer from Raynes Park to Collier's Wood, £25,000; widening and improvement of Crown-lane, £1,000; laying out of Abbey Recreation Grounds, £400, storm-water overflow sewer to river Wandle along London and Epsom road, £6,000, surface-water drainage, Watery-lane and Manor-road, £120, making up three private streets, £1,025, improvement of dangerous corners, £2,500; and painting and decorating offices, £40.

Mountain Ash U.D.C.—The council have in hand the plans for a housing scheme, and twenty-five houses will, it is reported, be proceeded with in the first instance.

Neath R.D.C.—The post-war schemes include a new road in the Dylais Valley, estimated to cost £10,000; a new road to connect the Vale of Neath at Glynneath with the Dylais Valley, a town planning scheme, and the extension of the waterworks.

Neath T.C.—The proposed town planning scheme after the war contemplates the purchase of land from various owners. Other projects are new roads in the Llantwit district, and from the Gas-works-road into the town.

The Town Planning of Greater London after the War.

By Professor S. D. ADSHEAD.

[We reproduce herewith the sixth—and last—of the recent series of lectures delivered by Professor Adshead at University College, London. In his previous lectures—extracts from or abstracts of which will be found in THE SURVEYOR of November 17th and 24th, and December 1st, 8th, and 22nd—Professor Adshead dealt with the advantages that would follow a considered scheme for the planning of Greater London, and reviewed existing conditions and outlined the most important of the proposals that have been made up to the present day. In his concluding lecture consideration is given to the ways and means by which all those advantages and amenities can be secured.

The proposals we have considered have not been merely the dreams of idealists, they have for the most part been the essential needs of the community as outlined by practical men.

Nor have they been proposals demanding an immediate expenditure of money; much more can be secured for the future by prevision and strong administrative action, assisted by some little improvement in our legal and administrative machinery, than by the spending of millions to satisfy immediate demands in a hasty and short-sighted way.

Let us then examine the system, if such it may be called, under which the development of London now takes place.

First, then, be it noted that of all the influences at work in the shaping of Greater London the most important are the railway companies and the various authorities responsible for local government. In addition, we must reckon with inherited traditions, habits and customs of the people, many of them obsolete, but which it is necessary to revise if progression is to be the order of the day.

LONDON'S GOVERNING BODIES.

In enumerating the more important of the governing bodies, there should be mentioned:—

First, the London County Council, who exercise a controlling influence over a restricted area, known as the administrative county. Within this area there are the twenty-nine boroughs who, independently of one another, are each responsible for the local government of their different spheres.

Then we have the city authority, financially the most powerful, whose area, buttressed with all the inherited traditions of administrative autocracy, is situated within the very heart of the administrative county, and whose exceptional powers, unlike those of its more youthful neighbours, the borough councils, enable it to act in entire independence of the county authority.

Outside the boundaries of the administrative county we have eighty-two urban and rural councils, each in a modified way submissive to the county authorities of Middlesex and Surrey, but independent of the London County Council, from whom they are separated merely by the very artificial administrative boundary.

Of State Departments, sitting in Whitehall and Westminster, with Parliamentary powers to control the workings of these local authorities, we have the Local Government Board, the Board of Trade, the Board of Agriculture, and the Road Board. These, again, with such restricted powers as they possess, may be said to act independently, and interpenetrating and interfering with the undertakings of this complexity of administrative machinery we have the railway companies, water companies, tramway companies, Trustees of Parks and Crown Property, and a Port of London Authority, who, by Private Acts, hold special privileges which they enjoy without reference to any other governing body.

With the administrative machine handled by so many independent authorities, and without any co-ordinated central authority, is it likely that in the matter of the town planning of Greater London, interests and aspirations common to every citizen and superior to local prejudices can be adequately secured?

NEED FOR A CENTRAL AUTHORITY.

No doubt much has been done, and much can still be done, by conference and negotiation; but, at the same time, there is most certainly needed a central authority capable of grasping and dealing with the whole problem comprehensively, an authority which is backed by, if not actual money grants that would enable it to undertake the carrying out of a big constructive programme, at least a sensible shaking of the money bags of the Treasury.

I have said that much has been done by conference and negotiation, but, with the best intentions in the world, the effect so far of these negotiations has resulted merely in the production of handsome but still-born schemes, and a general feeling of uncertainty, unreality and hesitancy.

I might follow up this reference to the list of authorities responsible with a review of their respective powers. I might dwell at length on the most important of these in reference to town planning. By so doing I might discover many unexercised powers.

It is true that much could be done in regard to the making of arterial roads by a full exercise of the powers held by the Road Board, and I am of opinion that in the Town Planning Act there are hidden away powers that, if adequately exercised, would enable the whole of Greater London to be town planned compulsorily. But where is the local authority, or even Government Department that has the courage, or shall I say the reckless audacity, in view of the public apathy, to take full advantage of the powers possessed. The real difficulty lies not so much in the lack of power as in its distribution, and in the acceptance of the responsibility that its exercise entails.

OBSTACLES TO MAIN ROAD SCHEMES.

As an example, let us take the case of the local authority through whose area it is agreed by the conference of local authorities that an important new arterial road should be constructed. We will assume that the local authority concerned has, with the best intentions, adopted the Town Planning Act, and desires to carry through the road in question. The powers held under this Act provide the means whereby this authority may decide not only the direction but also the width of the proposed new arterial road. Then where is the difficulty? The difficulty lies in the fact that the cost of the difference in width between the width of the road required as a main arterial road and as a by-law road is such as must be borne by that local authority.

How can this be met? Either by successfully negotiating with the landowner so as to obtain his consent to the giving up of the land without cost, or by a grant that through the Road Board can be made from the Treasury; otherwise the cost will fall upon the rates. But the carrying through of all these difficult negotiations is dependent upon the neighbourly sympathy and co-operation of the adjoining local authority, who, possibly not having the same interest in the road, will not undertake the negotiations necessary to the carrying of it through their locality. The reply is that the Local Government Board, convinced, as they no doubt would be, of the necessity of town planning in that area, can force that authority to do it compulsorily. But there is a risk that in doing so the Local Government Board may be faced with a financial responsibility. The Local Government Board cannot meet it, for they have no power to ask the Treasury to make grants for such a purpose, and so, tossed to and fro from owner to local authority, and from local authority to Government Department, the responsibility of carrying out main road schemes is so difficult as to have reached an *impasse*.

LOCAL AUTHORITIES' DIFFICULTIES.

But you would reply that all this question of liability for cost of road construction is not an issue under debate; that what is required is not the necessary funds for the construction of the road, but merely the powers for fixing the line. This is so; and it is also true, as already stated, that the local authority has in the Town Planning Act all the powers that are necessary for fixing both the direction and width of roads. But the difficulties here [illegible] in the case of the most sympathetic and best intentioned of local authorities. First, the [illegible] through whose land the proposed arterial road must pass has to be negotiated with, both in the matter of direction and also ultimate cost of extra width. The [illegible] agree on the first [illegible] but [illegible] the second and [illegible] the [illegible]

Who is going to relieve that local authority of the responsibility it incurs in forcing on the landowner the acceptance of a width, part of the cost of which the local authority may ultimately have to meet?

There might be in the first case a claim for sterilising merely so much of the land as was over the by-law width. That would be immediate, and ultimately there might have to be met the extra cost of constructing a wide road. So, assuming for the sake of argument that the local authority incorporated the road in its scheme, unless satisfactory arrangements could be made with the landowner there would at once be a general claim for the sterilisation of so much of the land as was over by-law width, a claim amounting to the value of such land. It would seem that the liabilities thus entailed should be borne by a higher authority.

Now, having regard to the proved reasonableness of many landowners, and the possibility of getting a considerable amount of the land required without cost, having regard to the interests of many of the local authorities in the making of the roads, having regard to the enormous importance of the carrying through of such an undertaking by London before it is too late, and having regard to the betterment that in most cases would ultimately accrue, the actual cost that would be incurred in ensuring that the land for the roads as generally approved by the conference of local authorities, if it were at once sterilised, would not be great.

The example of Liverpool proves that much can be gained simply by negotiations, provided such negotiations have a solid financial backing, which in the case of a local authority round London in very few cases exists. And why should a local authority provide roads of national interest?

The construction of main arterial roads should be undertaken and financed by a central authority, and whereas in the area of one locality there might be betterment and in the area of another considerable expense, such an undertaking would merely amount to an insurance scheme for local authorities constructing main roads that were promoted nationally.

But no existing Government Department has the necessary power to undertake this specifically. The Road Board can negotiate for land, or contribute to widenings and the improvement or construction of new roads, subject to restrictions, but it is doubtful if they could contribute merely to the cost of sterilisation.

But the construction of main roads, even though the most urgent of the proposals on the town planning programme as we see it to-day, does not satisfy every requirement. This, supplemented with a vigorous application of the Town Planning Act, would do much, but to ensure a full and satisfactory application of this Act there must be enacted legislation which will unify the proposals of railway companies with the considered proposals of town planning, and there must be powers to consider open spaces and the disposition of built-up areas comprehensively. The setting up of a new department empowered to deal with the town planning of Greater London in this way, and which, unlike the Local Government Board which possesses merely the critical faculty, is equipped to make and carry through a constructive policy, is the only satisfactory means whereby the full complement of benefits can be secured.

RAILWAYS AND BUILDING DEVELOPMENT.

In preceding lectures I have shown the importance of quick lines of transit to develop building estates, and I would urge that it is in the interest of railway companies seeking passengers to make their schemes submissive to a central authority for town planning, in order that they may avail themselves of the value of a co-ordinate policy whereby the line of route decided upon may be that best suited to assist building development. No other method will prevent lines of railways obstructing free development or the development of areas which, viewed from a broad standpoint, should be kept open.

It would be a mistake if such a central authority for town planning were to be any one of the existing authorities equipped with the necessary powers. It should be a composite body, possibly representing the interests of the London County Council, the City, the Middlesex and Surrey County Councils, the Local Government Board, the Board of Trade, the Board of Agriculture, and the Road Board.

Its staff would be highly technical, and it should be in a position to command the services of the most highly trained technical experts in the different departments of town planning.

It should have control over the direction of railways and methods of constructing the tracks; it should have control over the construction of main roads and public open spaces; and it should have power to town-plan Greater London in so far as the allocation of areas for residential and industrial development was concerned; and, finally, it should advise the spending of county or State funds on works of metropolitan interest, and which ought not to be locally borne.

The Government is at the moment in the throes of a great war, and it would be extremely injudicious to press upon them now the promotion of such a scheme, but very soon we must be prepared and see to it that the town planning of Greater London is not left to a hundred different authorities, who, with enlightened self-interest, may do remarkably well for their own particular locality, but who are quite unable to subscribe to the improvement and natural development of London as a whole.

We must beware of powers being given to an existing authority that can only take a one-sided view; we must demand the setting up of a real Central Town Planning Board, and nothing less. Now, I think we may take it for granted that no new department will be inaugurated during the period of the war, and meantime the chances of losing what we require are increasing daily, so that any intermediary action on the part of the Government, through an existing department, tending to the sterilisation of areas for roads is to be commended and encouraged.

STERILISATION OF LAND FOR ROADS.

We have shown that the sterilisation of land for the ultimate construction of main roads would necessitate the financial backing of the State. Negotiations with landowners with a view to ascertaining the liabilities entailed in order to sterilise the required main arterial routes generally agreed upon should at once be instituted, and having regard to the disinterestedness of local authorities in certain areas, such negotiations should be encouraged or proceeded with by a Government Department.

Financial assistance offered through the county councils or directly from State funds would ultimately be wiped off as betterment, so that it would only amount to a loan with deferred interest and sinking fund, as already explained.

The greatest difficulty would, of course, be met with in the matter of bargaining with owners, but this would be assisted in many cases by the substitution of an alternative route.

It does not appear to me that there ought to be any real financial difficulty in securing the sterilisation of all the roads proposed by the conference of local authorities, provided immediate action is taken on the lines suggested. Revision could be made after the war and before actual construction commenced.

A greater difficulty would be the prevention of building operations from proceeding in areas which ought certainly to be retained as open land.

CONTROL OF BUILDING DEVELOPMENTS.

When dealing with the future of building developments in Greater London, I dwelt at some length on placing restrictions on areas of development in what is now open country outside the confines of built-up London. I showed that no local authority acting in its own interest and in the interest of its ratepayers would, even with the assistance of the Town Planning Act, be able to control building operations in this way.

Such a considered treatment of Greater London could only emanate from a central authority. I showed also that it was absolutely essential, both in order to preserve the value of existing suburbs as well as to ensure the success of those that were to come, that open land be left around London as it exists to-day.

NATURE RESERVATIONS.

Then there is the question of how to acquire the chain of Nature reservations so essential to the complete equipment of London's recreative areas, and on the lines suggested by the map that has been prepared by the London Society.

A great deal of public education would have to be done before a Government responsible for its interests would undertake the purchase of large tracts of land for this purpose. I believe that the first essential of such undertakings is the education of the public. In due course and when the public have come to realise the value of retaining for ever a chain of Nature reservations round London, these ought to be acquired in several ways.

The Surveyor
and Municipal and County Engineer.

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A system adopted in many towns of America (and, indeed, we need not go to America for an example, as we have one in Wimbledon) has been to levy a rate on houses in proportion to their proximity to the open area, and when the need has been fully realised and ventilated, much can be obtained in the way of free gifts from landowners, and added to this there should be a contribution from county funds.

HOUSING.

But discourse on the town planning of Greater London that omitted to refer to the housing question is incomplete, for, after all, town planning is but the basis of a great housing and building scheme.

With a deficiency of 300,000 cottages for the working classes, which we are told is no exaggeration of the present needs, which means 1,000,000 people improperly housed, is it to be wondered at that housing, and not town planning, is at the present moment uppermost in people's minds? To expect the public to neglect housing and take up town planning under such circumstances is rather like asking a drowning man to study navigation.

The preparation of a town planning scheme is a long and laborious undertaking, demanding the exercise of considerable imagination; but to seize on an empty piece of ground and at once commence erecting thereon cottages is a direct and easily grasped undertaking.

It is perfectly obvious to me, as it is to most people, that an immediate supply of cottages will never await town planning; but I would point out that if the authorities concerned in the erection of cottages would, without waiting for the necessary permission to prepare a town planning scheme, without waiting for the promised Government grant, commence at once and prepare a comprehensive plan of their areas (they can get plenty of expert advice if they are so inclined), they could then find sites for cottages, which, when time had allowed of the complete development of a detailed town planning scheme, would ensure that, at any rate, they had not made what may be described as a fundamental mistake as regards site.

SURVEYORS AND COTTAGE DESIGN.

It is very likely that we shall shortly have local authorities authorised to prepare schemes for the building of cottages. I presume that if permission were granted the surveyor and his staff, who are certainly not qualified to undertake such work, would at once set about and make the plans.

I sincerely hope that it will not be done in this way. My own view is that what is wanted is a standard cottage, or two dozen standard cottages, prepared by a Government Department in conjunction with the big building trade manufacturers and builders, and with the best architectural advice, and adopted to Garden City principles.

The local authorities, most of whom are quite incapable of preparing a design for a cottage, should only be empowered to adopt these, and that should be a condition of the grant.

I feel very strongly on this point; otherwise leave cottage building to private enterprise and give them where they deserve it financial assistance of a more stable kind.

It is no new idea—villages of standard cottages were erected 100 years ago.

I am aware that the idea of a standard cottage sounds very unwholesome, but we are not living in the Middle Ages. We are living at a time when every individual cannot possibly express himself as he did then. Yet, on the other hand, we will not allow him to be numbered and ticketed till he hardly knows his own door, as he has been in his standard street of last century.

We are, I hope, entering upon what Prof. Patrick Geddes describes as a Neo-Technic Age—an age that realises that wealth and industry are but a means and not an end—and no man's private outlook must be so regulated as that he is nothing but an iron cog in the social wheel.

LONDON'S AMENITIES.

But I can express myself better by a reference. Let me point out the great pioneer example of the Hampstead Garden Suburb; think of all that it means as regards the individual interests of its inhabitants. Think of all the beautiful scenery that to-day surrounds London, its delightful old villages, its forest glades, its wild commons and village greens. With a panorama of all these amenities, than which no capital in the world is better supplied, let me conclude by saying: By all means give every consideration to the economic and scientific development of London, for only by so doing can we obtain physical essentials; but let us not forget the amenities, for only in their provision lies real culture and progression.

But the whole question of town development may seem irrelevant at a time when our vision is dimmed with the circumstances of this great war.

AFTER THE WAR.

It is almost certain that after the conclusion of peace it will be many years before the complete disbandment of soldiers not required for permanent service has taken place. What is to be done with these soldiers in the meantime? In my own view no better occupation could be given them, or, at any rate, such of them as were used to spade work and military engineering, than that of constructing roads. It will be a great pity if nothing better can be found for them to do than occupy themselves with the routine of barrack life.

The difficulties of providing them with useful occupations while under military discipline and supervision are great, but here in road making is an occupation very closely allied to that of their professional duties, and which could be undertaken under the ordinary conditions of military discipline. The supply of material for road construction is another matter; but, at any rate, they could be well employed in cutting, embanking and generally preparing the surface of the ground. This is a matter that might be gone carefully into and urgently pressed upon the Government at the right time.

In conclusion, let me emphasise the enormous importance to the future of London of setting up immediately after the war the sort of administrative machinery that will be able to guide the comprehensive development of London as a whole.

Watch the railways; let me impress upon you the importance of making the question of a new railway line a public one, and do not remain in obscurity until you hear that the thing is done. We must in the future be much more alive to what goes on at the committee stage of the passing of a Railway Bill.

Let me urge on you the importance of educating the general public. I believe that those of you who are engaged in propagandist work are doing greater things than you know. I have spoken of unexercised powers in town planning legislation; by your efforts, and only by your efforts, can legislation—which to-day is unexercised through public apathy, short-sightedness and ignorance—be converted into legislation all the clauses of which are strained.

Fog and Gas Consumption.—The Birmingham Corporation Gas Committee report that a record consumption of gas in the history of the department was, owing to the exceptional darkness due to fog, reached during the week ended December 20th, when the output was 309,000,000 cub. ft. The previous highest total was 296,000,000 cub. ft.

Madras Water and Drainage Works.

A RESTRICTED PROGRAMME: MAINTENANCE COSTS AND ECONOMIES.

When war broke out the Corporation of Madras had in hand water supply and drainage works [illegible] which was £1,500,000. The value of the work executed up to March last was about £800,000, leaving works of a value of about £1,000,000 still to be executed. In order to meet the financial [illegible] which arose after the outbreak of hostilities a restricted programme was prepared. This involves an expenditure of about £330,000, spread over five years, and is so selected as to form part of the comprehensive works which can be completed as soon as funds become available.

It is anticipated that the amount set aside for waterworks will enable a satisfactory supply to be obtained, provided waste and misuse can be reduced. The main works still remaining to be done, and not included in the restricted programme, are seven additional filters, and a waste-water prevention system.

In an exhaustive report which he has recently prepared, Mr. J. W. Madeley, M.A., M.INST.C.E., M.AM.SOC. C.E., the special engineer to the corporation, points out that, except for the works carried out during the last few years, the drainage of Madras is in a thoroughly unsatisfactory condition. The collecting drains, the pumps, and the pumping mains, all require renewal to a great extent, and it, Mr. Madeley says, will be impossible to bring the sanitary condition of Madras to that of a normal healthy city except by carrying out a comprehensive scheme of drainage, such as that which has been sanctioned by Government.

The sum which it is proposed in the restricted programme to spend on drainage works provides for the construction of three new pumping stations and re-engineering of [illegible]. A new pumping main is provided for the western area; this will relieve the present over-burdened southern area pumping main. "New sewers, laid at proper gradients and provided with apparatus to exclude silt, will," adds the engineer, "remove much of the insanitary nuisance that now gives rise to complaints. New gravitation mains will carry the sewage from the sewers to the pumping stations. The nett result should be a great reduction in [illegible] and a considerable improvement in the sanitary condition of the more thickly populated areas of Madras. The works proposed will be in conformity with the comprehensive main drainage scheme, and may be extended as urgency demands and funds permit, until the whole scheme has been completed."

WASTE AND MISUSE OF WATER.

The remarks of Mr. Madeley as regards the prevention of water waste are interesting. In a hot climate like that of Madras the temptation to waste water is very much greater than it is in the West. The restriction of consumption is a very difficult matter, and that this is not the case in Madras alone is proved by the experience of Bombay and Calcutta, where, in spite of very costly works to provide a continuous supply at high pressure, it has been found impossible to apply the full pressure continuously throughout the twenty-four hours.

That [illegible] is a source for great economy is obvious. Mr. Madeley observes: "Even we reflect that probably half the water supply of Madras is either wasted or misused. The installation rules should be enforced without fear or favour. [illegible] work, and the inspectors and assessors who have to carry it out should be given every possible protection and encouragement. The same remarks apply to the house-to-house inspection.

"A further method now in use for checking waste is to reduce the pressure of the water in the pipes, more especially during the hours of least demand. In addition, if it appears that abnormal waste is taking place at any point, the valve between the leading main and the street pipe is closed down so as to limit the rate at which water can be taken. In this manner the waste of water is reduced as much as is possible under present conditions without effecting [illegible] measures.

"In the future, as soon as funds are available, a complete high-service distributing system should be installed, such as is usually found in large towns in England. Recently [illegible] was [illegible] to adopt [illegible] in order to check [illegible] waste of water."

Mr. Madeley furnishes particulars of a twenty-four hours' experiment which was carried out to ascertain the effect of supplying water to the city under full pressure. The main objects of the experiment were: (1) To enable the inhabitants of Madras to form an idea of the pressure at which water could be supplied, if waste were sufficiently reduced; (2) to ascertain what would be the consumption under full pressure; (3) to find out how the pipes would stand the pressure.

HIGH PRESSURE SUPPLY EXPERIMENT.

As a result of the experiment—which would seem to have provided not a little in the way of excitement for the inhabitants—it was found:—

(1) That the water supply system was capable of supplying water to the upper floors of houses all over Madras. Indeed, many tanks on the tops of the houses overflowed, and messages were received from all parts of the city requesting that plumbers should be sent without delay to stop overflows and to remedy other defects that appeared.

(2) That, with the system as it now is, the water taken under full pressure was 23,500,000 gallons per day. As the main part of the system is designed to supply only 14,500,000 gallons per day, and the filters now constructed to supply 10,000,000 gallons per day, it is obvious that the present system cannot supply all the water that would be consumed at the present time under full pressure. Indeed, the present sources of supply, even if all irrigation were stopped, would be inadequate to supply the rate of consumption disclosed by the experiment.

Mr. Madeley suggests that it speaks well for the elasticity of the system and for the work of the staff that it was possible to maintain the full pressure for the whole period of twenty-four hours for which the experiment lasted and even for some four hours longer.

It may be interesting to state that the pressure maintained on the mains was about 50 ft. above ground level, varying from 40 ft. during the hours of maximum consumption to 55 ft. at night. The rate of supply varied from a maximum of 1,420,000 gallons per hour at seven o'clock in the morning to a minimum of 550,000 gallons per hour at night. The latter quantity represents wastage at the rate of 26 gallons per head per day.

(3) As was confidently expected, no failure of the pipes laid within the last few years took place, nor, so far as can be ascertained, did any of them leak. Some of the old pipes burst and in others leaks developed. These were serious in the case of certain 22-in. and 36-in. mains. Service pipes and house fittings also developed a number of faults.

(4) The inter-connection works, recently carried out, proved extraordinarily effective. Although two leading mains 22 in. and 36 in. in diameter had to be cut off, the areas served by them were never deprived of water.

(5) The experiment showed the necessity of overhauling the distribution system. This, says Mr. Madeley, can be done systematically and effectively only when the waste-water meter system has been installed. The necessary valves, meters, &c., are included in the sanctioned estimates, and the system would already be in operation but for the war. At the present time it is impossible to say when it will be possible to proceed with the work.

In the meantime, it is proposed to apply pressure to small sections of the distribution system, and by means of careful inspection and stethoscopic examination to detect the principal faults and then to put them right.

SELF-SUPPORTING WATERWORKS.

Mr. Madeley considers that the question of making the waterworks self-supporting should receive serious consideration. He has no doubt that there are advantages in the community having control of the supply of such a universal necessity as water, but he regards it as highly undesirable that the waterworks should add to the burden of the general taxes. The practice in Madras is to levy a water and drainage tax of 6½ per cent on the rental value of house property and to charge for all water used beyond a certain free allowance where the services are metered. The income from the tax has, however, never been apportioned between waterworks and drainage works, though Mr.

Madeley admits that the larger part should be allocated to drainage, which is unremunerative.

The water pumped at present he puts at 14,000,000 gallons per day, but of this quantity a considerable amount is lost owing to defects in the pipes. To this inevitable waste must be added the water supplied—without charge—for municipal purposes. At present it is impossible to measure this quantity of water, but Mr. Madeley estimates the waste in the street pipes, plus the water used for municipal purposes, as roughly two-fifths of the supply. This is inclusive of water supplied to municipal buildings, pumping stations, &c., but exclusive of water wasted through defective house services and fittings. Deducting two-fifths (5,600,000 gallons), there remains a supply of 8,400,000 gallons per day, which should all be remunerative.

At present the total water paid for is about 4,500,000 gallons per day, so that about 9,500,000 gallons per day is unpaid for.

REMOVAL OF NIGHTSOIL.

In the course of his report Mr. Madeley puts forward a strong plea for the adoption throughout the city of the water-carriage system for the removal of nightsoil. This, he contends, would involve no extra expenditure over the existing system, as the present expenditure on hand removal by sweepers and scavengers would be eliminated. "Moreover," he observes, in conclusion, "sweepers and scavengers are becoming increasingly costly and scarce, and as education extends it will spread such a loathing for scavenger's work as will make the general hand removal of nightsoil on present lines very expensive, if not impossible."

DUST COLLECTION AT SURBITON.

SURBITON'S ELECTRIC VEHICLES.

As stated in our issue of last week, Surbiton, Surrey, Urban District Council have agreed to the purchase, at a cost of £1,025 each, of two electrically

EDISON ELECTRIC DUST-COLLECTION VAN.

propelled dust vans from Edison Accumulators, Limited, Edison Building, 2 and 3 Duke-street, W.

The type of vehicle decided upon by the council is illustrated in the accompanying photographic view. It will be remembered that the committee dealing with the matter reported that with two vehicles and five fillers the whole of the house refuse in the district could be collected once a week, and that after the vehicles were purchased, at the end of three years, the cost of the dust collection would be about £530 per annum less than the cost of doing the work by the present system, assuming the contract price next year, and in the succeeding years, to be 10 per cent more than it is now. In addition, the council would have purchased the two vehicles outright, and would have a depreciation fund at the bank amounting to nearly £600.

Roadmaking in Canada.—Quebec Legislature has voted £1,000,000 for making better roads in the province.

Road Tarring in Somerset.—It was agreed at the last meeting of the Somerset County Council to grant £16,700 for maintenance tarring in rural villages and towns, and £3,400 for surface tarring in urban districts during the coming year, and to make application to the Road Board for a grant towards the cost.

ENEMY PRISONERS AND ROAD WORK.

A SOMERSET COUNTY COUNCIL DISCUSSION.

At the last meeting of Somerset County Council (the *Bristol Times and Mirror* reports) a recommendation was made by the County Works Committee in favour of the employment of prisoners of war on the highways, and that boards of guardians be recommended to provide accommodation for them in workhouses, so far as possible.

The chairman asked if there was any chance of prisoners of war being employed on the roads.

Colonel Kirkwood said he was afraid not, unless they got the money to reconstruct roads. They might be used in quarries adjacent to their roads.

Mr. Somerville said they were informed that there were no prisoners available.

Mr. Lean said he had had experience of Austrian Bohemians, and a better class of man they could not get. They would not run away, and he hoped they would be sent to the country districts, as they could be usefully employed on the land.

Mr. Somerville: I am talking of prisoners of war.

Mr. Lean said some military prisoners had been brought up on the land.

Mr. Kidner: I am told that there are practically none fit to go on the land.

The report was adopted.

RUSSIA'S MUNICIPAL SERVICES.

FIELD FOR BRITISH ENTERPRISE.

Russia as a field for British enterprise and for the employment of British capital is (says a writer in the "Russian Section" of the *Times*) attracting the attention of our manufacturers and financiers to an extent never known before in the commercial history of this country. The war is, of course, responsible for this awakened interest, and for the mutual desire of the Russian and British Governments and peoples to witness, when peace is concluded, a preferential exchange of trade between the two nations. Russia does not want to "replace Germany" by Britain or by any other country. She has endured German domination of her industries and commerce long enough *not* to desire to see any other nation installed in Germany's place. What Russia does desire is a single-minded co-operation by the British in the development of her limitless natural resources. She will welcome with open arms the assistance of British capitalists, manufacturers, and merchants in this gigantic task.

The tremendous scope for development may be gauged from such statistics as are available in regard to the equipment of the 1,231 municipal areas in Russia. Of these only 162 are lighted by electricity, 128 by gas, while 1,028 depend upon the kerosene lamp. In respect to other services, 219 municipalities have a system of aqueducts; 65 only have a main drainage system; 54 a service of tramways; 32 only are equipped with telegraphs, and 314 with telephones.

In addition to these administrative municipal areas there are large numbers of so-called villages with populations of from 20,000 to 30,000. All these towns and villages will begin to demand the same municipal services and amenities as the returned soldiers have seen to be regarded as indispensable among other communities, and in this work of social progress British engineers and manufacturers ought to take no little share.

New Municipal Buildings at Coventry.—The new municipal buildings at Coventry, which have been built at a cost of about £60,000, have been completed, and as the furnishing proceeds they will be occupied by the several departments of the corporation. The street frontages are carried out in Runcorn stone, with roofs of Cotswold stone, in the style considered best to harmonise with the surroundings and the ancient traditions of the city. The frontage to St. Mary's Hall is in brick and stone, in the designing of which the foregoing considerations have been taken into account. The building has a frontage to Bayley-street of 275 ft., to St. Mary's-street 116 ft., to Hay-lane 53 ft., and facing St. Mary's Hall of a frontage of 270 ft.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Was not the city of New York on right lines when it recently published an article stating that the man of the future will be "the man who can do things," and not the mere talker or politician, and that this man who can do things is to be found in the engineer? Is it not evident that the war has emphasised this opinion, and that the world will some day realise that the really useful man is the one who is capable of creation and organisation, and not the lawyer or the politician, who, as a rule, are prone to keep things back instead of pushing them forward? Have we not to thank the legislation of the past for many checks upon engineering progress?

* * * *

Has the question yet been definitely decided as to how long it is necessary to keep the traffic off a newly constructed concrete road so as to allow it to consolidate properly? Is the accepted time of three weeks sufficient, or is this period found to be too long in practice? Does it make any difference in the required time if the concrete is "fat" or "lean"? Does the quality of the cement affect the question? Do not the weather conditions make a considerable difference? Are not these and other questions some of the things one would like to know?

* * * *

When will a powerful "Utilisation of Waste Products Company" be formed to deal scientifically with house refuse? Is it a fact that New York has recently entered into a contract with such a company to deal with an average quantity of 1,300 tons a day of house refuse, and that the plant to be erected will be capable of dealing with 2,000 tons a day, on the most scientific lines and without causing the slightest nuisance? When shall we see London and other large cities in this country dealing with their refuse in a scientific and common-sense method instead of, as at present, wasting so much valuable material?

* * * *

Does not the United States Department of Agriculture set us a good example in their education of farmers by giving them detailed information on such subjects as obtaining water by rams or wind engines, &c., by advising them as to the sanitary requirements of their houses and farmsteads, the construction of their farm buildings, and the generation of power, as well as on a host of other matters on which it is to be feared most of our farmers are entirely ignorant? Would it not be an excellent thing if our Board of Agriculture could arrange something of the same kind for the instruction and assistance of the farmers of this country?

* * * *

Is it a fact as stated by Councillor Barrow at a recent meeting of the Town Planning Institute, that the average number of new houses annually required in this country is about 100,000, and that during the past two years only 10,000 or 20,000 have been erected? If this is so will there not be an enormous shortage of houses after the war? How is this shortage going to be met?

* * * *

Why cannot the wear and tear of the roads and railways in France and elsewhere at the seat of war be relieved by the construction of aerial lines or "air tramlines," as they are sometimes called? Could not the example be followed of a certain salt mine in California, where formerly the salt was carried in waggons over roads which became almost impassable from this traffic, and the journey took thirteen days, whereas now, by means of an aerial line, the salt is conveyed in larger quantities at about one-tenth of the cost and the journey only takes two and a-half hours? Cannot the engineers attached to our Army devise some such means of transport, and thus divert some, if not all, of the enormous traffic which is now so seriously affecting the condition of the roads and railways?

* * * *

Now that the name of Abraham Lincoln, the sixteenth President of the United States, is so prominently before the public, is it not interesting to find that, at one period of his life, he was something of a road engineer? Is it generally known that a Mr. Calhoun, a county surveyor, offered to take Mr. Lincoln to be examined, and that "Honest Abe" who was then the postmaster of the little hamlet of Salem, at once began surveying and levelling, and became Mr. Calhoun's assistant? Does not this go far to prove that the training of an engineer fits a man for almost any position in life?

* * * *

Is there anything in "nitro-energy," which, according to an American mining engineer, is to be the power of the future? Does it not read almost like a fairy tale when he states that with the apparatus he has invented "1 ton of nitro-energy is equivalent to 1,300 tons of coal, and is safer than petrol"? All this may be true theoretically, but can any practical use yet be made of the nitrogen which is in our atmosphere, and have not many attempts been made from time to time to harness this great natural force?

SHEET STEEL FOR STREET PAVING.

A town in the United States, Charlotte, North Carolina, is experimenting in the use of steel sheets as a paving surface. On one of its streets a roadway 7 in. thick is being built, consisting of a macadam base 4 in. in depth, covered with 3 in. of concrete. A wearing surface of steel plates is used which measure 18 ft. long, 30 in. wide, and ¼ in. thick. Trapezoidal-shaped perforations, 2 by 1½ by 1¼ in. in size, are placed throughout the plate at 1 to 1½ in. intervals. The shorter side of each perforation is uncut, and the metal is bent down to form a projecting lug on the under side. Connection between

Steel Sheets Laid in Concrete in Experimental Paving.

adjacent sheets is formed by fitting tongues on one side of one sheet into slots in the opposite side of the other sheet.

The steel sheets were placed in position and tamped to a solid bearing, with the tops flush with grade. Each steel sheet was joined to the one already placed by raising the outer edge and slipping the tongues of the new sheet into corresponding slots of the other plate. The new sheet was then lowered, and at the same time pushed close to the other sheet. A space of about ¼ in. was left between adjacent sheets.

Actual cost data on what has been done shows a unit cost of 8s. 6d. per square yard.

Flies and Food Contamination.—At a meeting of the Royal Sanitary Institute to be held at St. Helens Town Hall on Saturday, February 17th, Dr. Joseph Cates will open a discussion on the subject of measures to be taken to prevent contamination of food by flies. The chair will be taken at 10.30 a.m.

"THE SURVEYOR" SPECIAL ISSUE.

The Special Annual Issue of "The Surveyor" will be published on January 26th, and readers who propose to accede to our request for a short statement, for inclusion in the number, of the works projected by their authorities for 1917, will greatly oblige by making their return as early as possible. All other material, and particularly matter accompanied by illustrations, should likewise be forwarded without delay to ensure its appearance.

Municipal Work In Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Carlisle T.C.—It was reported to the Health Committee that the town clerk had laid before a special meeting the opinion of Mr. A. Macmorran, K.C., on the case he had submitted to him with reference to the claim of the Central Control Board (Liquor Traffic) to be exempt from compliance with the provisions of the different Acts and by-laws in force in the city with regard to new buildings, and that it had been resolved, in the circumstances, that no further action be taken.

Chorley T.C.—The borough surveyor, Mr. G. H. Hopkinson, has received instructions to report upon a proposed scheme of improvement of the council chamber.

Falmouth T.C.—A letter has been received from the Falmouth and Truro Port Sanitary Authority asking the corporation to appoint two representatives to a conference on the subject of a proposed small-pox hospital.

Halifax T.C.—The question is under consideration of providing central offices for the gasworks and electricity departments.

Rothwell U.D.C.—The council have adopted the suggestion of the county surveyor that each of the three authorities concerned in the repair of Newbottle Bridge—viz., the Kettering Rural District Council and the Desborough and Rothwell Urban District Councils—should bear a third of the cost.

Spenborough U.D.C.—It has been decided to appeal to the inhabitants for a subscription of £500, representing the proportion required for the district towards £6,000 wanted for the adaptation of the Dewsbury Union infirmary as a base hospital for wounded soldiers. The Local Government Board have ruled that the expenditure cannot be charged to the rates.

Tamworth T.C.—The town council are appealing to the Local Government Board for authority to purchase property in Upper Gungate for the erection of a new school.

HOUSING AND TOWN PLANNING.

Doncaster T.C.—Authority has been received by the town council for the preparation of a town planning scheme for Armthorpe and Kirk Sandall.

Dudley T.C.—The whole question of a housing scheme for Netherton is recommended by the Public Works Committee to be referred to the Housing Special Sub-Committee for consideration and report.

MOTOR TRANSPORT.

East Grinstead R.D.C.—It is proposed to convert one of the steam rollers into a traction engine for the purpose of hauling road materials.

Harrogate T.C.—The corporation have purchased a 3-ton Daimler chassis, fitted with a tipping frame and interchangeable lorry and tank bodies. The iron tipping frame is fitted with hand tipping gear, by means of which a tipping angle of 40 deg. may be obtained. The tipping frame, complete with the frame-shaped lorry body, was supplied by Messrs. Lockwood & Clarkson, Leeds. The tank, which has an approximate capacity of 650 gallons, is built of mild steel, and mounted on an underframe of English oak fitted with Messrs. Wadsworth's improved springs.

Portsmouth T.C.—The corporation have accepted the tender of Messrs. Foden, of Sandbach, for the supply of two steam motor wagons, at £800 each.

Rotherham T.C.—It has been agreed to purchase a two-seater motor car for the electricity and tramway department.

Tynemouth T.C.—The town council, having failed to obtain authority for a loan, have resolved to purchase a motor fire engine and other fire appliances out of revenue, at a cost of £1,500.

REFUSE COLLECTION AND DISPOSAL.

Birmingham T.C. The Public Works Committee have effected the purchase of land and buildings in Grove-road, King's Heath, for £1,800. There is a large clay pit on the property, and it is intended to make use of this for tipping house and street refuse.

ROADS AND MATERIALS.

Aberdeenshire C.C.—The road surveyor, Mr. Nicol, reported to the Huntly District Committee that a great deal of damage had been done to the district roads by heavy timber hauling. The chairman, Mr. R. H. N. Sellar, stated that if the war were to continue much longer it would become a serious matter for them to keep their roads in proper repair, and it would mean a very large expenditure of money. Mr. Wilson: If the war is to continue much longer, let us get the Germans to keep the roads in repair. The committee decided to confer with the parties responsible for the damage with a view to obtaining compensation.

Argyll C.C.—The council have resolved to borrow £4,000, free of interest, from the Road Board for the Ballachulish-Kinlochleven road.

Barnard Castle U.D.C.—Plans have been approved for widening the main road near the workhouse, at an estimated cost of £220.

Birmingham T.C.—With respect to the proposed improvement works in Drews-lane, which are estimated to cost £7,481, the Road Board have agreed, subject to the sanction of the Treasury, to lend the corporation £6,481 free of interest, the repayment to be spread over five years. The Government have already promised a contribution of £1,000 towards the cost of the scheme.

Bispham U.D.C.—A sum of £300 has been estimated for the repair of Blackpool-road, and the council are seeking for authority to incur expenditure in repairs to Red Bank-road.

Crediton R.D.C.—Notification has been received from the county council of their intention to take over the 64 miles of main roads which have hitherto been repaired and maintained by the rural council. The roads will be taken over as from March 31st next. The question of the conditions of the appointment of the surveyors, Mr. S. Pridham and Mr. L. E. Sharland, as affected by the altered circumstances was considered, and, in order to put the matter on a proper basis as it may arise on March 31st, it was agreed formally to give them three months' notice to terminate their appointments.

Greenwich B.C.—It is proposed to make up Bishop's-buildings, Thames-street, as a new street, at an estimated cost of £350.

Hailsham R.D.C.—Tenders for steam rolling have been accepted at 27s. per day, all inclusive, for the districts of Hove and Ninfield, and 30s. per day for the remainder of the district. An intimation has been received that the Road Board have agreed to pay £720 towards the cost of the repair of roads damaged by military traffic.

Taunton R.D.C.—The surveyor, Mr. T. G. Crump, has submitted an estimate for road maintenance for 1917-18 amounting to £4,059.—The council have decided to apply for a contingent of German prisoners for quarrying and breaking stones.

SEWERAGE AND SEWAGE DISPOSAL.

Birmingham T.C.—The Public Works Committee are advised that the condition of a length of the Hockley main sewer is giving rise to serious apprehension. The sewer is egg-shaped, 5 ft. 9 in. by 3 ft. 6 in., and is in parts threatened with collapse. It is essential that the length between Avenue-road and a point about 80 yds. below Thimble Mill-lane should be forthwith reconstructed. Detailed estimates of the works immediately necessary are in course of preparation, and these will probably amount to about £12,000. It is recommended that, subject to the consent of the Ministry of Munitions and the Local Government Board, the necessary works of reconstruction be carried out.

Blean R.D.C.—The engineer and surveyor, Mr. F. A. Ward, submitted the apportionment of expenditure on the Herne and Reculver sewerage and sewage disposal

a loan between the two parishes. This was as follows: Heene £14,758; Rogalvet £5,713. The loans granted were: Heene £10,578; Rogalvet £5,362. The additional loans refused were: Heene, £180; Rogalvet £351.

Chorley T.C. The Sanitary Committee have received authority to carry out sewer reconstruction in Hindley street.

Clutton R.D.C. The Local Government Board have sanctioned the council's application for a scientific report on the question of preparing and submitting sewerage schemes for the parishes of High Littleton, Paulton, Farmborough, and Timsbury in order to avoid unnecessary delay in proceeding with the work when the restrictions upon borrowing are withdrawn.

Nuneaton T.C. The town council are recommended by the Sewerage Committee to apply for a loan of £5,000 for sewerage works in the Coton road district, and £1,700 for completing the conversion of the contact beds into filters at Hartshill.

WATER, GAS, AND ELECTRICITY.

Aylesbury U.D.C. It is proposed to relay an electricity main at an estimated cost of £150.

Barking U.D.C. It has been decided to take up a loan of £5,000 for electricity mains extensions.

Barrow T.C. The town council are promoting a Bill in Parliament to increase the quantity of water which they are authorised to take from the river Duddon and its tributaries.

Bedford T.C.—The town council are considering recommendations by the electrical engineer for electricity extensions, including the installation of new plant, estimated to cost £35,000.

Eastbourne T.C.—It was reported on Monday that, owing to the large increase in the price of coal, and a diminution of the consumption of private and public light, there was a deficiency of £1,200 upon the working of the electricity undertaking during last year.

Glasgow T.C.—In connection with the decision to complete the new generating station of the electricity department at Dalmarnock, the Secretary for Scotland has sanctioned the borrowing by the corporation of a further sum of £500,000 for the execution of capital works, raising the total sum authorised to be borrowed for that purpose to £3,000,000.

Halifax T.C.—The Water Committee propose to effect various water main extensions, at an estimated cost of £9,000.

Hereford T.C.—It is now stated that the proposed extensions to the electricity undertaking will cost approximately £63,300, instead of £45,000 as originally estimated.

Llandudno U.D.C.—The electrical engineer has been instructed to report on the provision of a battery available for small loads.

Luddenden Foot U.D.C.—An agreement has been entered into with the Halifax Town Council for a supply of electricity for street lighting.

Middlesbrough T.C.—The town council last week resolved to borrow from private sources £125,000 for waterworks purposes.

Morecambe T.C.—The Gas Committee recommend the council to instal mechanical stoking plant at the gasworks.

Nottingham T.C.—The town council on Monday last adopted a recommendation of the Gas Committee to increase the price of gas for power and gassing purposes.

Nuneaton T.C.—The Water Committee recommend the installation of a water-softening plant at Griff, at a cost of £1,281 and the provision of new distributing mains at an estimated cost of £1,200.

Rotherham T.C.—Dr. Houston, of the Metropolitan Water Board, has been asked to report on the utilisation of the water at Ulley.

Southend T.C. The provision of two 750 kw. steam generators at Chalkwell Park is being considered by a sub-committee.

West Ham T.C. The Electricity Committee recommend the town council to instal a turbo-generator of 30,000 kw. capacity, at a cost of £19,745, and also a battery of 2,000 kw. capacity at a cost of £12,000.

Wivenhoe U.D.C.—It has been agreed to purchase a Diesel oil engine and starter, at a cost of about £300, for the waterworks.

Worthing T.C.—The town council on Tuesday resolved to increase the charges for electricity from 10 to 30 per cent on pre-war charges, with the exception of slot meters.

MISCELLANEOUS.

Bristol T.C. The Sanitary Committee have agreed to the proposal of Sir George R. Asquith, Chief Industrial Commissioner, that the matter of the wages of the road sweepers and ashmen should go to arbitration. The request of the men was that their wages should be regulated by the trade union rates, and in this connection it was reported that the wages of builders' labourers averaged 31s. 9d. per week for full time all the year round, but that in normal times they lost a sixth, which made their average weekly wages 27s., and for the four winter months 26s. 2d. A sub-committee decided that they were unable to grant the request. At the same time they would continue to keep the actual average earnings of the sweepers to the amount at least of the actual average earnings of the builders' labourers working according to the trade union wages and conditions as agreed by the employers and workmen of the Bristol district.

Midhurst R.D.C. It has been agreed to grant a war bonus of 2s. per week to employees engaged in road maintenance.

Worthing T.C.—The General Purposes Committee reported that Councillor Jackson had submitted a suggestion to experiment on the foreshore with a view to increasing the deposit of dry sand by means of low terraces of planks to be erected between groynes below high-water mark. It was resolved that a sub-committee be appointed to consider the proposition, and that an experiment be made if deemed advisable, at a cost not exceeding £30.

PERSONAL.

Mr. John Morgan, who has been acting as deputy surveyor, has been appointed surveyor to the Blaenavon Urban District Council.

Mr. W. Hayne, of Frinton, has been appointed surveyor and inspector to the Walton-on-the-Naze Urban District Council for the duration of the war.

Mr. J. Macdonald, Kingussie, has been appointed interim road surveyor to the Badenoch district of Inverness-shire during the absence of Mr. Grant on military service.

Mr. Lionel D. Lewis, engineer and surveyor to the Abertillery Urban District Council, has accepted a commission in the Road Service Battalion, attached to the Royal Engineers.

Mr. Ernest A. Mills, ASSOC.M.INST.C.E., of Birmingham, was on Wednesday appointed chief engineering assistant in the electricity department of the Leeds Corporation, at a salary of £350 per annum.

Mr. James Johnson, borough surveyor of Rawtenstall, has accepted the position of Captain in one of the companies now being formed by the county surveyor of Lancashire for road service in France. Mr. Percival Holt, chief assistant to the borough surveyor, will act as deputy during Mr. Johnson's absence.

OBITUARY.

Mr. Edgar Collins, deputy surveyor to the Mynyddislwyn Urban District Council, died recently, we regret to state.

Mr. F. E. Weaver, for over forty years surveyor, first to the Gloucester Highway Board and then to the Gloucester Rural District Council, died last week, we regret to report. He was seventy-four years of age, and during his final illness remarked that, until the last meeting an December 11th he did not think he had missed a meeting of the above-named authorities since 1872. He leaves a widow, two sons, and two daughters. One of his two sons is Mr. Henry J. Weaver, M.INST.C.E., of Gloucester.

Prevention of Cellar Flooding.—Much inconvenience is annually caused to those who possess a cellar and cannot use it on account of winter flooding. A case in point is the cellar of the Hope and Anchor Inn at Hanworth, Middlesex, which was formerly flooded every year to a considerable depth. In the summer of 1913 it was decided to prevent this continual nuisance and a treatment of Pudlock cement was given to the floor and walls. We learn that the cellar has been perfectly dry since, and is now used for storage in both winter and summer.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRY HELD.

Cork R.D.C. (December 20th. Mr. A. D. Price).—£1,000 for the improvement of the water supply to Passage West, Glenbrook, and Monkstown.—The money, it was stated, was required in order to improve the Parkgarriffe supply and prevent the influx of surface water and other deleterious matters. About 2,000 people were depending on that water supply, and the council's rent roll from that supply of water was about £280 per annum. The council had samples of water from that supply analysed, and the analyst's report was as follows: "This water, in its present condition, is loaded with organic matters, mostly of vegetable origin; the reservoirs need very badly to be cleaned, and filter beds need renewal. As regards quality, there is very little difference between this sample and the sample taken from the Pembroke supply. In its present condition this water must be ranked of moderate quality among second-class waters. Its constant use for drinking cannot be recommended." Mr. B. O'Flynn, engineer to the council, gave particulars of the scheme that he had prepared. The scheme would supply water to 2,000 people, and would give them 20 gallons per head each day.

APPLICATION FOR LOAN.

Arklow U.D.C.—£1,000 for the completion of the housing scheme.

LOAN REFUSED.

Aldershot U.D.C.—£1,000 for public conveniences.

LOANS SANCTIONED.

Blackburn T.C.—£5,000 for the installation of a tar-distillation plant at the gasworks.

Greenock T.C.—£6,000 for the gas undertaking.

Preston T.C.—£500 for shingling at the Alston reservoir.

New Houses in Manchester.—The number of new dwelling-houses in Manchester certified as fit for human habitation in the year ending October, 1916, is the lowest on record. It amounts to 119, as against 410 in 1915, 782 in 1914, 563 in 1913, 615 in 1912, 964 in 1911, 1,590 in 1910, and 2,344 in 1909. In the ten preceding years the average was over 2,000.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF AYLESBURY.

Applications are invited for the appointment of Temporary Surveyor's Assistant, subject to a month's notice on either side.

Applicants must be ineligible for military service, a good Draughtsman and Surveyor, and should have had experience in a Municipal Engineer's Office.

Applications, stating age, experience, salary required, and when able to commence duties, accompanied by copies of three recent testimonials, to be delivered at my Office not later than Tuesday, January 23rd, 1917.

WM. HAROLD TAYLOR.
Borough Engineer and Surveyor.

Town Hall, Aylesbury.
January 5, 1917. (3,225)

WANTAGE URBAN DISTRICT COUNCIL.
TEMPORARY SURVEYOR, INSPECTOR, AND COLLECTOR OF RATES, &c.

The Council invite applications for the above appointment during the absence of their Surveyor, Inspector and Collector on military service. Population, 3,628; acreage, 2,478 acres; mileage of main and district roads, about 9½ miles. Total salary, £2 5s. per week.

Applicants must be ineligible for the Army, and must hold the Certificate of the Royal Sanitary Institute.

Applications, accompanied with copies of two recent testimonials, to be forwarded to me not later than the 10th instant.

EDWD. B. ORMOND.
Clerk.

Wantage.
January 2, 1917. (3,227)

WANTED, Temporary Assistant, for short period, ineligible for Army, able to level, good draughtsman, tracer, &c.; keep wages and other surveyor's accounts, and be experienced in routine duties of surveyor's office.

Wages, 30s. per week. Applications, in own handwriting, stating experience, with copies of three recent testimonials, to be sent to the undersigned.

B. MORLEY,
Borough Surveyor,
(3,224) Tenby.

BATTERSEA BOROUGH COUNCIL.
TO CONTRACTORS AND OTHERS

The Council invite Tenders for the following from the 1st April next:—

1. Veterinary Attendance.
2. Horse Hire.
3. Supply of Materials for Cart and Van Covers.
4. Supply of Harness Material and Fittings.
5. Supply of Paints, &c.
6. Supply of Special Paints, Enamels, &c.
7. Supply of Painters' Sundries.
8. Supply of Varnish, &c.
9. Supply of Tools, &c.
10. Supply of Ironmongery, &c.
11. Supply of Granite, Macadam and Chippings.
12. Supply of Tar-macadam, Tar Paving, &c.
13. Supply of York Paving.
14. Supply of Thames Ballast and Sand.
15. Supply of Stoneware Pipes.
16. Supply of Timber, &c., for Carpenters and Joiners' Work.
17. Supply of Timber, &c., for Wheelwrights' Work.
18. Supply of Bricks, Cement, Lime, Slates, &c.
19. Supply of Iron Castings (Side Entrance Covers, &c.).
20. Supply of Iron Bars, &c., for Blacksmiths' work.
21. Removal of House and Street Refuse and Manure from the Council's Stables.
22. Supply of Disinfectants.
23. Supply of Coal and Coke.
24. Supply of Soaps, Oils, &c.

Forms of Tender, containing full particulars, may be obtained at the Town Hall, between 10 and 4 (Saturdays 10 and 1), or by sending me stamped addressed envelope under cover, endorsed "Tender Form," and no Tender will be considered unless made on such Forms.

Tenderers must pay the Trade Union rate of wages in all departments. Tenders, in separate envelopes, sealed and marked on the outside "Tender for ——," must be delivered to me by 3 p.m. on Wednesday, 24th January next, together in the cases of Nos. 11, 13, 14 and 15, with Samples, carriage paid.

W. MARCUS WILKINS,
Town Clerk.

Town Hall, Battersea.
January 4, 1917. (3,229)

OTLEY URBAN DISTRICT COUNCIL.

The above Council are prepared to receive Tenders for the following Materials for the year ending March 31st, 1918:—

1. Setts, Kerbs and Flags.
2. Granite Macadam.
3. Pitch and Tar.
4. Slag Dust.
5. Tar-macadam.
6. Limestone Macadam.
7. Brushes.

Specifications and Forms of Tender can be obtained from Mr. O. Holmes, Surveyor to the Council, and to whom the Tenders must be sent not later than Wednesday, the 31st day of January, 1917.

The Council do not bind themselves to accept the lowest or any Tender.

C. J. F. ATKINSON,
(3,226) Clerk.

CIVIL ENGINEER AND SURVEYOR, ten years' experience, desires spare time employment: tracings, &c., neatly executed; edging and colouring carefully done; terms moderate.—Box 1,597, office of THE SURVEYOR, 24 Bride Lane, Fleet Street, E.C. (4,228)

NEW WATER SUPPLY AND OTHER MUNICIPAL WORKS AT WATFORD.

It will be recollected that at the meeting of the Institution of Municipal and County Engineers held at Watford on October 7th a paper descriptive of the new water supply and other municipal works of that town was presented by the engineer and surveyor to the urban district council, Mr. David Waterhouse. The gathering was reported in our issues of October 13th and 20th, but our account of the discussion which took place did not include Mr. Waterhouse's reply to the numerous questions which were put to him in the course of the proceedings. As we stated at the time, it was arranged that this should be furnished in writing, and it has just been made available in the Institution "Journal" for December, in which the official report of the meeting appears.

Mr. Waterhouse, in answering the many questions asked by the members, has found it more convenient to group his replies under the headings of the subjects in the order in which they appear in the paper.

Water Consumption.—In reply to Messrs. E. Y. Harrison, Bennetts and Marshall, the consumption of water was 25 gallons per head per day, and the actual waste in this amount was considerably less than 7 gallons per head per day. The Deacon waste detection meter system was the one which they had in operation, and the water supply area was laid out in fourteen waste inspection districts.

With regard to the washering of the taps, the water inspectors always carried a supply of washers, and they were put on free of charge.

Electrical Turbine Pump.—In reply to Mr. E. Y. Harrison, the electrical pump was of the turbine type, and no violent alterations of pressure were possible, unless, of course, a very large draw-off of water took place either on the inlet or outlet side of the pump. Such changes of pressure would not be due to the pump itself, for as long as this runs at the same speed the pressure remains constant between the suction and delivery sides, so that no trouble can possibly be experienced when using a pump of this type for this purpose.

Wells.—In reply to Mr. R. S. Henshaw, the rising columns were suspended directly from a flange arranged inside the pump-head. The top end of each rising column was fitted with a special cast-steel supporting piece provided with lifting rings, the opening in the pump head was made sufficiently large, whereby the flanges on the rising column may easily pass through. No other support was provided, so that the whole weight of the rising column was taken in the manner explained, and at any time can be easily withdrawn.

The rising columns were made of lap-welded steel pipes having the flanges welded. They were grummeted and the flanges faced and turned in the lathe, so that all the pipes being machined perfectly true at their connections, no difficulty was experienced in keeping them vertical.

The distance from the engine-house floor to the end of the suction pipe was 157 ft. 3 in., but the whole of the pump-work was made strong enough so that, should it be necessary, it would be possible to lower this and obtain a maximum lift of 300 ft.

In reply to Mr. Collins, the false bottom of the lining tubes was fixed on the bottom of the tubes, and was composed of three layers of wood sufficiently strong to withstand the water pressure for the depth. After the tubes had been sunk to the required position, the wood bottom was broken out with the chisel, the pieces floating to the surface. The annular space between the tubes and the chalk was filled with cement let down by a funnel pipe after the tubes had been driven into the solid chalk to the required depth.

Pumping Plant.—In reply to Mr. Harrison and Mr. Wakelam, the actual cost of fuel for raising 1,000 gallons of water 100 ft. was not yet available, but, estimating coal at £1 per ton delivered at the pumping station (from which the cost for other prices of coal would be directly proportional), and allowing for the steam through the engine cylinder and jackets, and the necessary fuel used in banking the boilers overnight, the cost of coal per 1,000 gallons of water raised 100 ft. was 0·45 of a penny.

Under the specification in the contract, the makers guaranteed a steam consumption of not more than 11½ lb. for steam passing through the engine cylinders per pump-horse-power per hour, with the condensation from the cylinder jackets in close circulation.

In reply to Mr. Collins, the effect of cutting off the steam in the intermediate and low pressure cylinders necessarily causes back pressure on the high and intermediate cylinders respectively, and the object of the cut-off valves on the intermediate and low pressure cylinders was to enable these back pressures to be controlled, and so reduce free expansion to a minimum when the exhaust valves were opened to the exhaust and whereby the maximum useful work was obtained from the steam, and consequently the highest possible economy.

The compensating device is fully explained in the paper under the heading "Pumping Plant."

In the event of a burst main, the hydraulic accumulator operates in conjunction with the compensating device; the top cylinder of this was in direct communication with the delivery main, and immediately the pressure in the delivery main falls, from whatever cause, the pressure in the oscillating cylinders was at once reduced, destroying the compensation in proportion to this reduction, and the engine at once shortened the length of the stroke and was prevented from running away or doing itself any damage, as would most likely happen in the case of a flywheel engine which was not properly controlled.

In reply to Mr. Marshall, as stated in the paper, there were two complete engine sets, one of which would always act as a stand-by.

Water Softening.—In reply to Messrs. Wakelam and Harrison, the pre-war estimated cost of softening, based on the cost of lime at £1 per ton, and including maintenance and labour, but excluding any capital charges, was ¼d. per 1,000 gallons. The estimated amount of lime required was 1½ lb. per 1,000 gallons, but this amount may vary with the character of the water and the quality of the lime.

The pressure available for cleaning the filter cloths was the old reservoir pressure of 62 lb., but this pressure would be considerably increased with the new reservoir. The cleaning of a filter was done in one operation, which occupied about three minutes. The average life of a filter cloth was about twelve months.

In reply to Mr. Collins, the water passing through the inlet to the filter was deflected to the bottom of the tank, and, rising up between each plate, ensures uniform filtration.

In reply to Mr. Henshaw, it is not the intention at present to convert the deposit from the softening plant into quicklime.

Reservoir.—In reply to Mr. Wakelam, the pre-war estimated cost of the 2,000,000-gallons service reservoir, exclusive of the cost of land, was £12,100.

Sewage Discharge.—In reply to Mr. Marshall, the discrepancy between the amount of sewage discharge and the water consumption was explained by the fact that the waste from three large breweries, which have their own water supply, and also a certain amount of rain water from roofs at the rear of houses, was discharged into the sewers.

In reply to Mr. Wakelam, the sewage farm is in the area under the control of the Thames Conservators, and is visited by their inspectors.

Cardiff-road Sewage Pumping Station.—In reply to Mr. Willis, the static head on the sewage pumps at the Cardiff-road pumping station was 56 ft. When the screening tank at this station was cleaned out the sludge was gravitated to the low-level ejectors, which send it forward to the high-level ejectors at Willow-lane, and on to the farm.

Ejector Station.—In reply to Mr. Marshall, the alternating valves were put on the Willow-lane ejectors because they were not able to deal with the sewage as it came down to that station. The estimated additional quantity dealt with since the alteration was made was 25 per cent of the volume raised. The advantage of the alternating arrangement was that the work was continuous and not intermittent, and the air main and sewage delivery main were utilised to their fullest capacity.

Destructor.—In reply to Messrs. Harrison, Collins and Cutler, the coal bill for sewage pumping in 1903, when the destructor was built, amounted to £740 per annum; the population at that time was about 33,000.

In earlier years when the destructor was shut down for week-ends when they had no refuse, and quarterly when it was shut down for cleaning, they turned over on to coal-fired boilers; but in recent years, by an arrangement, they obtained steam from the electricity department. In the event of destructor steam failing this supply was

always available, but they could at any time go back to coal-fired boilers, one of which had been retained.

In working the destructor they were helped considerably in past years by a refuse heap near by, from which they obtained fuel when they ran short from the town; this was especially useful in summer-time, when refuse was of less calorific value than in the winter. They had never used coal in the destructor.

The war had considerably affected the quality of the town refuse, its calorific value had decreased, and this summer they had only sufficient to keep going sixteen hours each day out of the twenty-four.

In reply to Mr. Marshall, the destructor had four grates, each capable of burning 10 tons of refuse per day. There had been no necessity for them to use more than three grates.

CLEANSING OF REFUSE RECEPTACLES.

By T. ROBINSON,
Sanitary Inspector and Cleansing Superintendent, Bolton-upon-Dearne.

[In a report which he has recently issued, and from which we make the subjoined extracts, Mr. Robinson deals with the cost of cleansing the different types of receptacles for refuse, and its relation to the question of converting privy middens to the water-carriage system.]

The houses in the district of Bolton-upon-Dearne, numbering 2,028, are fitted with three types of receptacles—viz., dustbins, 806; ashpits, 168; and privies, 1,054. The cost for cleansing during 1915-16 amounted to £523 15s. 9d., or an average cost per house per annum of 5s. 2d. The average cost per privy and ashpit per annum was 5s. 8½d.; that for dustbins being 4s. 4d. per annum.

A comparison for the last three years shows a very satisfactory reduction in the average cost of cleansing the receptacles per annum of from 7s. to 5s. 2d., notwithstanding that during 1915-16 the advance in wages, including war bonuses, amounted to £42 5s.; besides which there were 106 additional new houses with dustbins to be cleared, and this, calculated on the basis of 4s. 4d. per house per annum, would mean an extra cost of £22 19s. 4d.; making the total extra expenditure during the year £65 4s. 4d.

The increased prices of horse food, tools, &c., also affect the total saving adversely, but these items cannot be estimated. The real saving when allowing for increased wages and additional houses was for 1914-15, £150 14s. 11d.; and for 1915-16, £220 12s. 10d.; making a total for the last two years of £371 7s. 9d.

It will be seen that it is much less costly to cleanse dustbins than other types of receptacles. With the present number of houses, if all privies were converted and dustbins substituted it is estimated that the whole of the scavenging could be done in five days instead of six. This would enable the present staff to deal with refuse from an additional 400 houses weekly. Thus, if conversions were to take place coincident with building operations it would obviate the necessity of an increase in the staff, which in the ordinary course will be necessary before long.

At the present time conversions are made entirely at the property owners' expense, and it is a question for the consideration of the council whether the benefit to be derived to the public health would more than compensate for the expense incurred if the council were to adopt a general scheme of conversions under the Public Health Amendment Act, 1907, whereby half the cost of each privy and waste-water closet conversion would be borne by the council.

The cost to the council would probably not exceed £3,000 for privy conversions and £500 for waste water closet conversions. Although this may seem a large expense to incur, yet by the substitution of dustbins for privy middens, on the basis of this year's costs a perpetual saving of £72 9s. 3d. per annum would be effected. This is based on 1,054 privies at 1s. 4½d. each.

A Dearne Valley Water Board Scheme.—The Hoyland Urban District Council have passed a resolution declaring it expedient for the council, in conjunction with the Bolton-on-Dearne (and any other council whose district is wholly or partly within the limits of supply of the Dearne Valley Waterworks Company), to form a water board and purchase the water company's undertaking, and to promote a Bill in Parliament in connection with the scheme.

A RURAL WATER SUPPLY.

CLERK OF CHEPSTOW COUNCIL'S PLAIN SPEAKING.

At the meeting recently of the Chepstow Rural District Council, the clerk, Mr. F. Evans, read letters from the Tintern Parva and Chapel Hill Parish Council declining to accept the Crown water scheme, and also a communication from the clerk to the county council asking for information as to the present position of the Tintern water supply, as the matter was receiving the attention of the county medical officer. The clerk said that the matter had assumed an important position. It seemed to him that that council was wholly responsible, and they had nothing to do with the parish councils. It was only a matter of sentiment that prompted them to consult the parish councils. The time had now come for them to act, and it was their plain duty to do so.

Mr. Williams wished to know if Mr. Hobbs had been written to in regard to the "Crown scheme" since the last meeting.

The clerk replied that he had had no instructions to do so.

Mr. Williams observed that he did not think the people would have the water at the price Mr. Hobbs quoted before.

Mr. Heath: Unless it is a very urgent case, I think it had better stand over at a time like the present.

The clerk: It cannot stand over.

In reply to questions, Mr. Harrison (surveyor and sanitary inspector) stated that the school and several cottages were without a proper water supply.

Mr. Price said that Tintern was well supplied with water, but it was a cruel shame that there should not be a supply of water at the school. That matter had been under discussion for four or five years.

The clerk: You'll look very small indeed if the Local Government Board come down and force it upon you.

After further discussion it was decided on the motion of Mr. Price that a letter should be written to the school managers asking them to provide a water supply at the school, and the question of the water supply for the district was deferred for three months.

The clerk characterised the resolution as one of the most ridiculous ever passed, and, speaking as one who knew the Local Government Board, he warned the council that they were "running into a charging bull." If they neglected to do what the Crown proposed they were accepting a serious responsibility. He only wanted to say that to clear himself.

The chairman: That's quite clear.

BIRMINGHAM PUBLIC WORKS DEPARTMENT.

THE SCHEME OF REORGANISATION COMPLETED.

The Public Works Committee of the Birmingham Town Council state in a recent report that conditions brought about by the war having led to a cessation of executive work in connection with large schemes, advantage has been taken of this to carry out a reorganisation in the administration of the public works department. For this purpose the city has been divided into three administrative divisions, known as the Central, Western, and Eastern Divisions, and each of these has been placed under a chief surveyor. It is hoped, the report proceeds, that as a result of this reorganisation a greater efficiency in the working of the department will be attained, and the city surveyor relieved of the constant attention to detail administration which has hitherto engaged a considerable proportion of his time. In this connection the committee draw attention to the fact that, owing to the scarcity of labour and the impossibility of securing materials, a considerable number of the roads of the city are falling into a bad state of repair, and that some day a large expenditure will be required to bring them up to modern requirements.

During the past summer 247 miles of streets have been tar-sprayed, as compared with 177 miles sprayed in 1915. In selecting the macadamised streets to be tar-sprayed preference was given to the motor-omnibus routes and main roads, and to the poorer class of streets where the houses are built right up to the side of the street. Of the last-mentioned class 405 streets were treated.

Welsh Housing.—The Welsh Housing Association has asked the Government to allocate not less than £5,000,000 to Wales for housing after the war.

INSTITUTION OF MUNICIPAL ENGINEERS.

President. MR. HENRY C. ADAMS, M.INST.C.E., M.I.MECH.E., F.R.SAN.I.
President-Elect. MR. EDWARD WHITWELL, F.I.S.E., M.S.A., Engineer and Surveyor, Abersychan Urban District Council. (Lieut. R.N.V.R.)

ANNUAL MEETING.

The eighth annual general meeting will be held in London to-morrow (Saturday).

PROGRAMME.

11.30 a.m.—Council meeting.
11.45 a.m.—Meet in the council chamber, No. 4 Southampton-row, W.C.
12 noon.—Annual general meeting.
Minutes of last annual general meeting.
Presentation of annual report of council.
Announcement of result of ballot for election of president and council for the year 1916-17.
Installation of president.
Any other business.
12.45 p.m.—Adjourn for lunch.
2.30 p.m.—Reassemble in council chamber.
Presidential address.
Discussion on the following papers to be presented to the meeting:—
"A *Résumé* of Public Health Matters," by G. Belson Chilvers, M.R.SAN.I. (Member).
"Practical Road Work," by Geo. Rodley (Member).
"Notes on the Use of Electricity in Municipal Engineering," by Horace Boot, M.I.E.E., M.I.MECH.E. (past-president).

B. WYAND,
Secretary.

39 Victoria-street, S.W.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

CHIEF WATER INSPECTOR. January 8th. Doncaster Town Council. £150 per annum. Mr. R. E. Ford, acting water engineer, Mansion House, Doncaster.

SURVEYOR AND INSPECTOR OF NUISANCES. January 8th. Chertsey Urban District Council. Mr. Arthur Atkinson, junr., acting clerk, Public Offices, Chertsey, Kent.

SURVEYOR AND INSPECTOR.—January 9th.—Knighton Urban District Council.—Mr. W. A. Collins, clerk, Council Offices, Knighton, Radnorshire.

SANITARY INSPECTORS. January 9th. Bermondsey Borough Council. £150 per annum. Mr. F. Exell, town clerk, Town Hall, Spa-road, Bermondsey, S.E.

ASSISTANT WATERWORKS ENGINEER. January 12th. Guildford Town Council. Minimum wages 70s. per week, with a bonus and rates free. Average hours 48 to 60 per week. Mr. E. Y. Harrison, borough surveyor and water engineer, Town Gate, Guildford.

MAIN ROAD DISTRICT SURVEYOR. January 12th. Derbyshire County Council. £250 per annum.—Mr. J. W. Horton, county surveyor, County Offices, Derby.

TEMPORARY BOROUGH SURVEYOR.—January 12th. Corporation of Montrose. Mr. J. P. Watson, town clerk, Town Hall, Market Lane.

SURVEYOR AND INSPECTOR.—January 15th.—Dorking Urban District Council. £220 per annum.—Mr. W. J. Hodges, clerk, 64 South-street, Dorking.

ASSISTANT ENGINEERS. March 31st. Indian Public Works and State Railways Department. Not less than twenty-six and not more than twenty-four years of age on July 1st. The Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT ELECTRICAL ENGINEER.—Government Electric Light Department, Fort-road, Malta. Salary £200 rising by £20 annually to £300. Messrs. Preece, Cardew, Snell & Rider, 8 Queen Anne's-gate, quoting M.I.E.E.—1/1/17.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

BEDWELLTY.—For a second-hand temporary building of wood framing, lined with matchboarding and covered with corrugated iron sheets. Dimensions 20 ft. by 16 ft., or thereabouts.—Mr. D. H. Price, surveyor, Aberbargoed, Mon.

Engineering: Iron and Steel.

WIGAN. January 8th.—For the supply of a 30-h.p. motor tower wagon, for the Tramways Committee.—Mr. F. Buckley, general manager, Corporation Tramways, Market-place, Wigan.

ALNWICK.—January 8th.—For providing and fixing four sluice valves, for the rural district council.—Mr. H. W. Walton, clerk, Alnwick.

SYDNEY.—January 8th.—For the supply and erection of pumping machinery in two units, driven by suction gas or by steam, for the Iverell water supply, for the New South Wales Department of Public Works.—Department of Commercial Intelligence, Basinghall-street, E.C.

WEST HAM.—January 11th.—For the supply of one water-tube boiler, and one 3,000-kw. turbo-alternator, for the town council. Mr. J. W. Beauchamp, 84 Romford-road, Stratford.

CARRICK-ON-SHANNON. — January 11th. — For pumping a supply of water, about 60,000 gallons daily, from the Shannon into a reservoir, and lighting the town with electric light, for the rural district council. —The Secretary, Waterworks Committee, Town Hall, Carrick-on-Shannon.

MERTHYR.—January 17th. — For supplying and laying 760 yds. of 12-in. and 9-in. stoneware pipes, for the Merthyr and Aberdare Joint Farms Management Committee. — Mr. W. B. Harris, clerk, Town Hall, Merthyr.

AUCKLAND (New Zealand).—January 21st.—For the supply of mild-steel or iron gates and fencing, for the Harbour Board. Messrs. W. & A. McArthur Canberra House, 18-19 Silk-street, Cripplegate, London, E.C.

Roads.

LEWISHAM.—January 9th.—For the supply of about 9,000 super. yds. of wood paving on concrete, for the borough council. — The Borough Surveyor, Town Hall, Catford, S.E.

NORTH RIDING.—January 10th.—For team labour and hauling (day work and by tonnage), and for macadam and steam rolling, for the county council.—Mr. W. G. Bryning, county surveyor, County Hall, Northallerton.

SPILSBY.—January 12th.—For the supply of 4,000 tons of broken granite, 8,000 tons of broken slag, and 500 tons of slag chippings, for the rural district council.—Mr. W. Cooke Brackenridge, district surveyor of highways, Spilsby.

DURHAM.—January 13th.—For tar-spraying on the main roads, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

BRENTFORD. January 13th. For the supply of 250 yds. of ¾-in. Guernsey granite chippings, for the urban district council.—Mr. J. W. Croxford, surveyor, Clifden House, Boston-road, Brentford.

HERTS.—January 13th.—For the supply of broken granite, slag and tar-macadam, for the county council. —Mr. J. S. Killick, county surveyor, Hatfield.

WOODBRIDGE.—January 15th.—For the supply of granite or basalt broken to pass through a 2½-in. gauge, and to be rejected by a 1½-in. gauge, whole chalk flints, washmill flint, pit flint, Kentish rag, and any other road material, for the rural district council. —Mr. G. Cook, district surveyor, Ipswich-road, Woodbridge.

SOMERSET.—January 20th.—For steam rolling and scarifying, for the county council.—Mr. Gordon R. Folland, acting county surveyor, Wells, Somerset.

SOMERSET. January 20th.—For the supply of broken granite or basalt, for the county council. Mr. Gordon R. Folland, acting county surveyor, Wells, Somerset.

WORCESTERSHIRE.—January 20th. — For the supply of granite, blast-furnace slag, and tar-macadam, for the county council.—Mr. C. F. Gettings, county surveyor, 30 Foregate-street, Worcester.

ESSEX.—January 20th.—For the supply of team labour, stoneware pipes, Norwegian granite kerb and setts, York kerb, and distilled tar, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

ESSEX.—January 20th.—For tar-spraying on main roads, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

MIDHURST.—January 21st.—For the supply of broken granite, for the rural district council.—Mr. A. G. Gibbs, surveyor, Council Offices, Midhurst, Sussex.

SURBITON.—January 22nd.—For the supply and delivery of refined or distilled tar, for the urban district council.—The Surveyor, Council Offices, Ewell-road, Surbiton.

DORSET.—January 24th.—For the supply of granite, basalt, limestone, and tar-macadam, for the county council.—Mr. E. H. Habgood, acting county surveyor, County Offices, Dorchester.

RAMSBOTTOM.—For laying 1,000 sq. yds. of lonkey setts on concrete foundation, for the urban district council.—Mr. T. H. Bell, surveyor.

Sanitary.

HALIFAX.—January 8th.—For the construction of 2,500 lineal yds. of 15-in. and 12-in. iron and earthenware pipe sewers, and manholes, for the corporation. —Mr. J. Lord, borough engineer, Town Hall, Halifax.

ANNFIELD PLAIN.—January 8th.—For the removal of refuse, for the urban district council.—Mr. T. J. Trowsdale, acting sanitary inspector, Council Offices, Hare Law, Annfield Plain.

BULKINGTON.—January 9th.—For the removal of nightsoil, for the urban district council.—Mr. H. W. Wilson, surveyor, Attleborough, Nuneaton.

BURNLEY.—January 12th.—For the supply of men and harnessed horses for machine sweeping and watering of streets, and for the supply of men, carts and harnessed horses for the removal of refuse, for the corporation.—Cleansing Superintendent, Aqueduct-street.

COULSDON.—January 13th.—For the supply on hire of horses and men for the removal of refuse, for the urban district council.—Mr. E. J. Gowen, clerk, Council Offices, Purley.

WILLESDEN.—January 15th.—For the removal of refuse, for the urban district council.—Mr. S. W. Ball, clerk, Municipal Offices, Dyne-road, Kilburn, N.W.

CHELMSFORD.—January 16th.—For the construction of a surface-water drain and other drainage works, for the corporation. — Mr. P. T. Harrison, borough engineer, Municipal Offices, Chelmsford.

HAMBLEDON.—January 16th.—For scavenging the district, for the rural district council.—Mr. F. Smallpiece, clerk, 138 High-street, Guildford.

NORTHWICH.—January 22nd.—For the collection and removal of refuse, for the urban district council. —Mr. J. A. Cowley, clerk, Council House, Northwich.

Stores.

DESBOROUGH.—January 8th.—For the supply of tar-macadam, broken granite, slag, gravel, sanitary pipes, blue bricks and paviors, and Portland cement, for the urban district council.—Mr. W. Marlow, surveyor, Council Offices, Desborough.

HORNSEY.—January 8th.—For the supply of road materials, paving, granite and general mason's materials, mason's and pavior's work, Portland cement, forage, iron and steel, disinfectants, and cartage, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor, Town Hall, Southwood-lane, Highgate, N.

ST. PANCRAS.—January 8th.—For the removal of sweepings and gully soil, horsing water vans, horsing road sweeping and other machines, cartage, timber and joinery, barrows, trucks, handles, paints, oils, tools, Yorkshire stone and artificial paving slabs, granite kerbs, paving setts, broken granite, Kentish rag, gravel, lime, cement, stoneware pipes, bass brooms, horse-brush stocks, pitch, tar, and creosote oil, for the borough council. — Mr. W. N. Blair, borough engineer and surveyor.

HAMPSTEAD.—January 10th.—For slopping, team work, Yorkshire and other natural footway paving, artificial footway paving, broken granite, basalt, gravel, hoggin, shingle, ballast, sand, pitch, tar, creosote oil, tar paving, tar-macadam, ironmongery, tools, iron castings, brooms, sorting-house refuse, disinfectants, and electrical engineer's stores, for the borough council. — Mr. A. P. Johnson, town clerk, Town Hall, Hampstead, N.W.

PLYMOUTH.—January 15th.—For the supply of paints, varnishes, ironwork, petroleum oil, broomheads, household brushes, rope, iron and steel, pitch-pine, deals, flooring, carbolic powder, Portland cement, lubricating oils, tar and pitch, painter's brushes, explosives, soap, wood blocks, creosote, disinfectant fluid, granite kerbs, setts, white lead, red lead, linseed oil, turpentine and turpentine substitute, refilling machine revolving brooms, benzoline and motor spirit, tools, indiarubber goods, hose, and ship chandler's goods, for the corporation. — Mr. James Paton, borough engineer and surveyor, Municipal Offices, Plymouth.

Miscellaneous.

SALFORD.—For the supply of brushes, for the Lighting and Cleansing Committee. — The Superintendent, Wilburn-street Depot, Salford.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

3.—Institution of Sanitary Engineers: Presidential Address. Caxton Hall, Westminster, 7.30 p.m.

5.—Town Planning Institute: Prof. P. Abercrombie and Mr. S. A. Kelly on "A New Town Plan for the City of Dublin." 6 p.m.

6.—Institution of Municipal Engineers: Annual Meeting, 4 Southampton-row, London, W.C.

11.—Institution of Electrical Engineers: Messrs. F. Gill and W. W. Cook on "The Principles Involved in Computing the Depreciation of Plant." 8 p.m.

25.—Concrete Institute: Mr. C. R. Peers on "The Care of Ancient Monuments."

APPOINTMENTS OPEN.

CHERITON URBAN DISTRICT COUNCIL.

APPOINTMENT (TEMPORARY) OF SURVEYOR AND INSPECTOR OF NUISANCES.

The Urban District Council of Cheriton invite applications from gentlemen willing to act during the war as Surveyor and Inspector of Nuisances, subject (as to the latter office) to the approval of the Local Government Board.

Applicants (who will understand that they are asked to take the place of the Official who is away on military service) must be ineligible for military service. They must have efficient knowledge of Sanitary matters and Sewerage Works, and be fully competent to carry out the duties usually appertaining to the respective offices, including those of a Hackney Carriage Inspector, and those specified in any By-laws in force within the Urban District, and also the duties under the Dairies, Cowsheds and Milkshops Order, the Factories and Workshops Act, the Housing and Town Planning Act, and the duties of Petroleum Inspector, &c.

The area of the District is about 1,179 acres, with about 5 miles of roads, and a population of 7,577. The Main Roads are not under the Council's jurisdiction.

Applicants must be prepared to spend their whole time, if appointed, in the duties of their office. Private practice might be allowed with special leave of the Council. The successful candidate will be required to give the usual bond, the premium on which will be paid by the Council, and to enter into a written agreement with the Council.

Applications (endorsed "Surveyor"), stating age, experience, and salary required, with copies of not less than three recent testimonials (which will not be returned) as to character and competency, must be made in candidate's own handwriting, and sent so as to reach the undersigned not later than the 8th day of January, 1917.

Canvassing Members of the Council will disqualify.

NOTE.—The salary at present authorised by the Local Government Board for Inspector of Nuisances is £105.

(By order of the Council)

ARTHUR ATKINSON, JUNR.,
Acting Clerk.

Public Offices,
Cheriton, Kent. (3,201)

DERBYSHIRE COUNTY COUNCIL.
MAIN ROAD DISTRICT SURVEYOR.

Wanted, immediately, for the period of the war, Temporary District Surveyor, ineligible for military service, to take charge of Main Roads in a district under direct maintenance.

Salary at the rate of £220 per annum, to include provision and maintenance of motor bicycle. An additional allowance of £10 per annum will be made for provision of office.

Particulars of duties, &c., and Form of Application can be obtained from the undersigned, to whom applications must be sent on the special Form not later than Saturday, January 13.

J. W. HORTON,
County Surveyor.

County Offices, Derby.
January 2, 1917. (3,223)

APPOINTMENT WANTED.

ENGINEER AND SURVEYOR'S Chief Assistant, under 40 years of age, ineligible for military service, is open to substitute for similar engagement with important Local Authority. Advertiser is fully qualified, and has considerable experience in all works in connection with the Surveyor's Department of large Local Authorities.—Box 1,599, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (3,220)

TENDERS WANTED.

DORSET COUNTY COUNCIL.
TENDERS FOR MAIN ROAD MATERIALS.

The County Works Committee are prepared to receive Tenders for the Supply of Granite, Basalt, Limestone and Tar-macadam, delivered to Railway Stations and Wharves in the County during the year ending 31st March, 1918.

Particulars and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, marked "Stone Tender," must be delivered to me not later than Wednesday, 24th January, 1917. Samples must accompany Tender.

E. H. HABGOOD,
Acting County Surveyor.

County Offices,
Dorchester.
January 2, 1917. (3,221)

SURBITON URBAN DISTRICT COUNCIL.
TENDERS FOR THE SUPPLY OF REFINED OR DISTILLED TAR.

Tenders are invited for the Supply and Delivery of Refined or Distilled Tar, required for use on the Roads in the District under the control of the above Council, for the period from 1st April to 30th September, 1917.

Specifications and Forms of Tender can be obtained on application to the Surveyor to the Council.

Tenders must be delivered to me at or before noon on Monday, January 22nd, 1917.

The Council do not bind themselves to accept the lowest or any Tender.

FREDERICK W. WOOD,
Clerk to the Council.

Council Offices,
Ewell-road, Surbiton.
December 29, 1916. (3,222)

ESSEX COUNTY COUNCIL.
HIGHWAYS COMMITTEE.

The Essex County Council are prepared to receive Tenders for the year ending 31st March, 1918, for the Supply of Materials, Team Labour, &c., as set out in the Schedule below:—

1. Team Labour.
2. Stoneware Pipes.
3. Norwegian Granite Kerb and Setts, York Kerb, &c.
4. Distilled Tar.

Forms of Tender, with the special envelope in which Tenders are to be delivered, and all other information and particulars, can be obtained at the County Surveyor's Office at Chelmsford.

Tenders to be delivered on or before Saturday, the 20th January, 1917.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
December 28, 1916. (3,218)

ESSEX COUNTY COUNCIL.
TENDERS FOR TAR-SPRAYING.

The Highways Committee invite Tenders for Tar-spraying on the Main Roads in the County of Essex during the year 1917. The area to be sprayed will be approximately 750,000 super. yds.

Specification and Form of Tender may be obtained on application to the undersigned, to whom sealed Tenders, endorsed "Tender for Tar-spraying," are to be delivered on or before Saturday, 20th January, 1917.

The Council do not bind themselves to accept the lowest or any Tender.

PERCY J. SHELDON,
County Surveyor.

December 28, 1916. (3,219)

BOROUGH OF PLYMOUTH.

Notice is hereby given that after the expiration of 10 days from the date hereof the Corporation intend to enter into Contracts for the Supply of the following Goods and Materials for one year:—

Schedule No. 3.—Section A.—Paints.
Section B.—Varnishes.
" " 5.—Ironwork.
" " 7.—Petroleum Oil.
" " 8.—Broomheads.
" " 9.—Household Brushes.
" " 10.—Rope.
" " 11.—Iron and Steel.
" " 13.—Pitchpine, Deals, Flooring, &c.
" " 14.—Carbolic Powder.
" " 15.—Portland Cement.
" " 16.—Section A. — Lubricating Oils (Samples to be submitted by Tenderers).
Section B.—Fuel Oil.
" " 17.—Tar and Pitch, includes refined tar for use in the construction of tarred macadam roads and for tar-spraying.
" " 18.—Painter's Brushes.
" " 19.—Explosives.
" " 22.—Soap (Yellow, Carbolic, Toilet, Soft).
" " 23.—Wood Blocks, Soft.
" " 24.—Creosote.
" " 28.—Disinfectant Fluid.
" " 29.—Granite Kerbs, Setts, &c.
" " 30.—White Lead, Red Lead, Linseed Oil, Turpentine and Turpentine Substitute.
" " 31.—Refilling Machine Revolving Brooms.
" " 33.—Benzoline and Motor Spirit.
" " 34.—Tools.
" " 35.—Indiarubber Goods, Hose, &c.
" " 36.—Ship Chandler's Goods (Sundry Oils, Waste, Grease, Metal Polish, Matches, &c.).

With the exception of Schedules 4, 17, 19, 21, 23 to 29 inclusive, 31, 32, 37, 38, the Schedules include for the Supply and Delivery of Materials to Wrangaton Station, Great Western Railway, about 13 miles from Plymouth, for the Plymouth Borough Asylum.

Tenders must be based on the whole of a Schedule (with the exception of Schedules Nos. 3, 4, 15, 21, 22, 26, 29, and 36), and not on any particular item contained therein.

(Separate Tenders will be considered for Sections A and B of Schedule No. 3, also Sections A and B, Schedule 16, and Sections A, B, C, Schedule 26.)

Schedules may be obtained on payment of a deposit of £1 in cash for each Schedule. The deposits on the Schedules will be returned, provided *bonâ-fide* Tenders are received on or before the 15th January, 1917. Should the Contractor withdraw his Tender, or fail to send in one, the amount of his deposit will be forfeited, and the Contractor who applies for the Schedules must do so on the distinct understanding that he is willing to abide by the terms of this advertisement.

The lowest or any Tender will not necessarily be accepted.

Tenders to be delivered not later than Monday, January 15th, 1917, addressed to the undersigned.

JAMES PATON,
Borough Engineer and Surveyor.

Municipal Offices,
Plymouth.
December 15, 1916. (3,207)

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

A New Year's Creed.

By way of a New Year's greeting we print the following lines, which are anonymous, but probably American:—

"I know, as my life grows older
And mine eyes have clearer sight,
That under each rank wrong somewhere
There lies the root of right;
That each sorrow has its purpose,
By the sorrowing oft unguessed;
That, as sure as the sun brings morning,
Whatever is, is best."

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Rural Housing.

As indicated in our last issue, the recently issued report of the special committee appointed by the Surveyors' Institution to consider after-war problems was divided into two parts, dealing respectively with urban and rural aspects of the question. We then dealt at some length with the recommendations of the committee so far as urban areas are concerned, and this week we propose to discuss shortly the rural report on the reconstruction of agriculture and forestry. This part of the report is directed mainly to making suggestions for securing prosperity to agriculture after the war, and, although much that is said does not affect municipal engineers professionally, the whole is of great general interest. The serious nature of existing agricultural conditions is shown by a tabular statement, the figures in which indicate that, without any appreciable increase in the amount of live stock kept, this country produced less wheat by upwards of 7,000,000 quarters in 1914 than in 1874, and nearly 3,000,000 quarters less barley. The war has amply demonstrated that this serious reduction in the home production of grain may become a real menace to our national security. Among the suggestions put forward for meeting the situation is one in regard to rating. The committee consider that the complaints which are made against the existing system of rating are due mainly to the increasing burden of the rates, and to the fact that a large proportion of the cost of national services, such as education and the maintenance of main roads, to which the increase is chiefly due, falls disproportionately upon farmers, who obtain no commensurate advantage. They therefore suggest that relief should be granted from the Exchequer in regard to these services—a recommendation which is in entire accord with the views we ourselves have frequently expressed.

In discussing the amelioration of rural conditions, it was, of course, inevitable that the committee should deal with the rural housing problem, and it is the part of the report which treats of this subject which will probably be of the most direct interest to our readers. It is evident that agriculture cannot be revived unless some means can be devised of attracting labour to the land. To do this involves (1) a reasonable standard of wages, (2) the provision of suitable arrangements for housing the labourer and his family, and (3) reasonable prospects of advancement. The first two of these factors are so interdependent that they must be considered together. In stating that in rural districts there is "on the whole" a shortage of cottages at the present time, the committee use words which are scarcely adequate to describe the great scarcity which exists in every part of the country. It is apparent therefore that any attempt to secure a large increase in the rural population must be preceded by cottage building on a large scale. A general rise in agricultural wages, so as to enable the labourer to pay an economic rent for his cottage might attract the capital of the speculator for building purposes. On the whole, however, we feel with the committee that it would be unwise to place too sanguine a reliance upon the assistance likely to be obtained from outside investors in solving the problem of housing in rural districts. The question then arises as to whether the landowner will do what is necessary. There can be little doubt that he will do much if he can secure a rather better return on his capital than is possible in present circumstances. In so far, however, as he fails to meet the need, it must, as the committee point out, be met by the local authorities, who should have compulsory powers with regard to the purchase of sites. In this connection the recommendation of the committee is that where, after inquiry by the Board of Agriculture, a shortage of houses for the natural requirements of a parish or district is found to exist, the provisions of the Housing (No. 2) Act, 1914, should be put into force, and if the landowners do not themselves erect the necessary houses, the sites should be obtainable at the market price of the land, if necessary under compulsory powers.

The Organisation of Forestry.

No scheme of rural reorganisation after the war would be complete if it did not include an attempt to place afforestation on a more satisfactory footing. It has been estimated that there are about 9,000,000 acres of land in the United Kingdom suitable for planting with trees, and if only a fraction of this vast area were dealt with a good deal of healthy outdoor work would be provided. The dependence of the country on

foreign sources of timber supply is shown by the fact that in the last complete year before the war over 11,000,000 loads of timber were imported. This was largely stopped by the advent of war conditions, which imposed other necessary work upon our shipping, and it at once became necessary to organise home supplies as far as possible to meet the resulting shortage. The result has been an immediate consumption of home-grown timber out of all proportion to the amount which might properly be looked upon as annually available. The supplies for the future have thus been very seriously depleted and the need for a national scheme of afforestation accordingly emphasised. If, as is feared, the war should be followed by a period of acute unemployment, the inception of afforestation schemes would be a most useful method of relieving the situation, inasmuch as, apart from the value of the land, from two-thirds to five-sixths of the initial cost of new plantations would be expended on labour. As far as local authorities are immediately concerned, however, proposals for afforestation would be confined principally to the planting of catchment areas in connection with water schemes. The committee express the opinion that every encouragement should be offered to municipal and other authorities to prepare and carry out carefully considered schemes for the planting of these areas, as being advantageous (*a*) to ratepayers, in view of the value of woodlands for conserving a water supply and preventing the silting up of reservoirs, and in the gradually accumulating capital represented by the growing trees; and (*b*) to the nation, by providing a further source of employment to the population, and creating a reserve of timber against a time of need.

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Subsiding Highways.

Apropos of the discussion at a recent meeting of the Stokesley Rural District Council (referred to in our issue of December 22nd last, at p. 570 with reference to the subsidence of the field footpath between Stokesley and Great Ayton, we think it may be of interest to our readers to consider briefly the duties and rights of highway authorities with respect to subsiding highways. It may be stated as a general principle that, in ordinary circumstances, it is the duty of a highway authority to keep all their highways (both roads and footpaths) in such repair and condition as to be reasonably passable for ordinary traffic at all seasons of the year, and to do whatever may be necessary to that end. Where, however, a highway has been rendered impassable, whether by natural causes or otherwise, the question may arise whether repairs are reasonably practicable, with reference either to the nature and situation of the highway or to the character of the accident or operation which has rendered it impassable, or whether it has been wholly destroyed (in which case the liability to repair it is at an end). Where, for instance, a road crossed the bed of a river, which flooded it at every tide, washing away the materials of which it was composed and leaving a deposit of mud, the authority were relieved of the liability to do repairs which, in the nature of things, must always be ineffectual (*Rex* v. *Landulph*, 1 Mau. & S., 393). But where, on the other hand, a road had been carried away by a landslip, and the work of restoration involved no exceptional difficulty or unreasonable expense, it was held that it must be carried out (*R* v. *Croydon*, 1876, 1 Q.B., 703).

Applying these principles to the case of a subsiding highway it seems clear that, *primâ facie*, and in the absence of special circumstances, it is the duty of the authority to do whatever may be necessary to make it as convenient as it was before the subsidence. This need not necessarily involve the raising of the way to its original level, and indeed there may be circumstances in which this would be inadvisable, as, for instance, where the subsidence is the result of mining operations, and the cost of raising it would be considerable. In *Wednesbury Corporation* v. *Lodge Holes Colliery Company, Limited* (72 J.P., 417), a road had subsided in consequence of the working of the company's coal mines, and the corporation restored it to its former level, and claimed to be repaid the expense by the company. But it was held by the House of Lords that the company were not bound to pay more than the cost of making the road as commodious to the public, within reasonable limits, as it was before. But, although the authority are not necessarily bound to restore the original level of every or any subsiding highway, it is clear that they have the right to do so, even although this may obstruct the access to the premises of a frontager (*Atherton* v. *Cheshire County Council*, 60 J.P., 6).

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Burst Water Mains.

There can be no doubt that the general rule of law that, apart from the provisions of special statutes in certain cases, damages cannot be recovered from water undertakers in respect of injuries caused either to roads or to private property by the bursting of mains unless negligence can be proved operates very unjustly. In the memorandum on the subject submitted at the December meeting of the Association of Municipal Corporations two specific instances were cited. The first occurred in Chiswick a few years ago, when a main belonging to the Metropolitan Water Board burst, causing damage to the highway which cost some £120 to repair. The board denied liability, but ultimately repaid the amount as an act of grace. In the second case, which occurred at Ealing, the board were not so graciously inclined, and, resting on their strict legal rights, they declined to repay a sum of upwards of £300 spent by the local authority in similar circumstances. The hardship really arises from the fact that it is usually quite impossible to prove negligence in the laying or maintenance of old mains. In one case, however, within our knowledge, the plaintiff, in an action against a water authority, whose property had been damaged by the bursting of a main, succeeded in the early stages of the proceedings in getting an order for inspection of the main at the point of fracture, which had been removed to the offices of the authority. This inspection was made by an expert on behalf of the plaintiff, and revealed a flaw in the main in the nature of a hole which had been filled in with foreign metal. The result was that the action was compromised by the water authority, who paid damages rather than take the matter into court. We merely mention this in order to show that it is certainly worth while to endeavour to find some evidence of negligence, although such a task may not appear to be a very hopeful one. It would work more equitably on the whole, perhaps, if the law were to presume negligence from the fact of the burst, and put upon the water undertakers the burden of rebutting such a presumption.

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Dublin Workshops: How Not to do it.

The complaints made recently with respect to the Dublin Corporation municipal workshops have had a sequel which will not come as a surprise to those who appreciated the position as it was then disclosed. Mr. Rice, law agent to the corporation, has made inquiry into the status of the workshops, and his report constitutes a whole hearted condemnation of these concerns, alike in their inception and management. It appears that the workshops, although a corporation department and a corporation undertaking,

"financed and maintained out of the rates," are to a large extent treated by the corporation itself as an institution having no relation to civic authority, and dealt with in all business transactions in the same manner as if they were a firm of contractors altogether outside and independent of the corporation. While the Workshops Committee's estimates are placed in close competition with the estimates of outside firms, the corporation at the same time compels the committee to give to the men terms of employment, leave, holidays, and sick leave which are not imposed upon outside employers, and which exemption enables outside employers to compete with the Workshops Committee on the most favourable terms. The result was such as might have been anticipated by the merest tyro in business affairs. The committee, in carrying out the city council's orders, were forced to quote higher prices than the outside firms, with the result that comparatively little work was executed by the department. And all this time the committee have kept men "standing idle and receiving pay out of the rates"!

Surely futility could hardly go further than this. With a candour which is more than justified, Mr. Rice asserts that "it is an insane proceeding for the committee or for the council to retain on the basis of permanent employees any men for whom it cannot guarantee continuous work, and on the other hand it seems to me to be a very foolish proceeding to endeavour to establish corporation workshops upon any basis but that of carrying out through the corporation workshops all the corporation works which are not already in the hands of established departments, so far as the same can be carried out by the Workshops Committee." He proposes to cut down the staff to the absolute minimum, but we should say that a better remedy for such an extraordinary example of municipal ineptitude would be to abolish the department altogether.

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The Metric System.

The extreme trade competition—to avoid a harsher phrase—in which this country will be engaged after the war renders it imperative that every possible step should be taken which will enable us more efficiently to discharge the task which we shall have to undertake. In this connection there is a strong current of opinion that the adoption of the metric system of money, weights, and measures would be of material assistance to the mercantile community. As is pointed out in a circular recently issued by the Decimal Association, our customers in foreign countries do not easily understand quotations and specifications based upon the British system, and as time can ill be spared for the calculation of equivalents, there is a strong temptation for them to go to other markets where the system to which they are accustomed is in use. In any event, the retention of the present system must inevitably involve many calculations, with the consequent risk of error and waste of time. At present the British manufacturer who sells goods in metric-using countries must work on one system of weights and measures for his home trade and another for his foreign business. In merchants' offices the principals, clerks, and others associated with the work are compelled to use both systems of measurements. As few men can think clearly in two systems and truly estimate values or dimensions, it is difficult to compete with countries which are not burdened with weights and measures unintelligible to their neighbours. Thus the war provides strong additional reasons for urging a reform which many believe to be long overdue, and it is to be hoped that the Government may be induced to take the matter into serious consideration at a very early date.

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Animals on the Highway.

In our issue of August 4th last we made a few observations on the subject of animals straying on the highway, and we referred to several cases in which the question of the liability of the owner of such animals for accidents due to their presence had been decided. It may be remembered that in one case fowls, in another cows, and in the third sheep, were the cause of an accident, and that in each instance the owner of the animals was absolved from liability to the injured party; albeit that in the case of the sheep the owner had been fined under sec. 25 of the Highway Act, 1864. In each of these cases the animals had *strayed* on to the road, and were unattended. But in the recent case of *Turner* v. *Coates* (*Times*, November 24th last) an accident was caused by an unbroken colt belonging to the defendant which was being led by a boy from one farm to another, the defendant himself following it. The plaintiff (a nurse) was cycling along the road, and the colt, taking fright at the bicycle lamp, dashed across the road and knocked her over. In this case the court held that the defendant was liable, drawing a somewhat fine distinction between "harmless" animals, such as sheep and fowls, and an unbroken colt, which is likely to be dangerous on the highway. We should think that to most users of the highway there is not much (if any) less risk in the presence of "harmless" animals wandering about at their own sweet will, than there is in that of a "dangerous" animal under some sort of control; and this decision, satisfactory as it may be in some aspects, does not appear to us to go very far towards removing what we cannot but regard as the anomalous state of the law on this subject. For our own part we confess that we cannot see on what principle the owner should be considered less culpable in the case of straying animals than in the case of a led animal brought on to the highway for the legitimate purpose of passage. If fine distinctions are to be drawn, we should have thought that the former was the more culpable of the two.

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The Institution of Municipal Engineers.

The Institution of Municipal Engineers enjoys the honour of having as its president this year one who is on service, and who was consequently unable to be present at the annual meeting to deliver his inaugural address. It would be idle to suggest that Mr. Whitwell's absence was not keenly felt, but as far as possible it was atoned for by the very able presidential address which he had prepared. This was a model of what such an address should be, in that it comprised a survey of the whole field of municipal engineering work without entering into too much detail in regard to any section. Considerations of space prevent us from reviewing the address at any length, but there are one or two points to which attention may perhaps be specially directed. His remarks with regard to security of tenure were very sound. Our own view has always been that this question is inextricably bound up with those of qualification and pay, and to this Mr. Whitwell assents. It is only by strenuous united effort, however, that anything is ever likely to be achieved. In regard to housing, the situation was well summed up. Once turn to the real aspect, said Mr. Whitwell, once understand that correct and sensible housing accommodation—which must include all the essentials for health and all the securities from disease—is as vital to the well-being of the nation as it is to the individual, then, and then only, will it be realised that, instead of building to fit the means, it is necessary to fit the means to the building.

New York City Water Supply.

THE CATSKILL MOUNTAINS SCHEME.

By W. J. E. BINNIE, B.A., M.INST.C.E., F.G.S.*

[Concluded from last week.]

The pressure tunnels which have already been referred to were employed for a total length of 35 miles at seven different points, and it is an expensive type of construction, costing nearly £30 per foot run. Owing to the fact that these tunnels are subjected to internal pressure, the waterway is circular, 14 ft. 6 in. in diameter, giving a cross-sectional area of 165 sq. ft., the hydraulic gradient being arranged so as to give the higher velocity necessary to discharge the same quantity of water as the cut-and-cover type. The longest pressure tunnel is that under New York itself, where the length is about 15 miles.

The enormous pipes necessary to carry such large volumes of water were out of the question under the streets of New York, already taken up with pipes, cables, tramways, subways, and sewers, and this pressure tunnel deep in the rock was really the only feasible method of solving the problem at anything like a reasonable cost. The water is conveyed to the surface through pipes connecting with the tunnel below at various points, there being twenty-six connections 4 ft. in diameter and six connections 72 in. in diameter, the pressure in the mains at street level being from 80 lb. to 100 lb. per square inch.

The Croton aqueduct is a pressure tunnel 33 miles long, but the maximum internal pressure to which it was subjected was only about 180 lb. per square inch. The low maintenance charges of this aqueduct was an important factor, and determined the use of pressure tunnel instead of pipes when the conditions were suitable.

In addition to the tunnels under water pressure, there were twenty-four tunnels through mountains constructed on the hydraulic gradient, and called grade tunnels, the longest being a little over 2 miles and their total length being 14 miles. They were constructed of horseshoe section, having a waterway of 199 sq. ft., and cost about £22 per foot run, being therefore nearly twice as expensive as the cut-and-cover and about three-quarters as costly as the pressure tunnels.

Pipe syphons are used to the extent of about 6¾ miles, and cost about £17 per foot run. Generally speaking, only one line of pipe, of riveted steel 9 ft. 6 in. in diameter to deliver 250,000,000 gallons per diem, was laid in the first instance, provision being made for two others to be added when required. It would thus appear that, for a syphon to carry the same amount of water, there would be very little difference between the cost of the pressure tunnel and the steel pipes.

The maximum head to be carried was 360 ft. of water, and the steel varied from ⅞ in. to ¾ in. in thickness, the maximum stress being rather over 5 tons per square inch of the steel. A pipe so thin in relation to its diameter requires, of course, additional support, which was provided by means of concrete backing varying from 6 in. to 18 in. in thickness, and this concrete also protects the outside of the pipe from corrosion.

The question of corrosion gave the engineers much concern, and investigations were carried out which showed the great value of Portland cement as a protective covering, and the pipes were accordingly lined inside with 2 in. of Portland cement mortar. Owing to distortion of the pipe under varying loads, it is, of course, impossible to obtain perfect contact between the steel and the mortar lining, but experiments showed that even with the mortar separated from the *Londonderry*, to the extent of 1·25 in., percolating water lost the other hand its corrosive power. The remainder a hundredth, and the short portion which terminates enormous difficulty voir—consists of cast-iron pipes was laid that it by the syphon under the *Croton*, 1876. 1 Q B. sible point was designed. stion was entered into

Applying these principles as finally determined ding highways a section checks has been satisfactory, and in the absence of special cir the duty of the authority to do ing Silver Lake necessary to make it as economical two more before the pipe does. This need n

service reservoirs were constructed, the first called the Kensico reservoir, situated about 75 miles from the commencement of the aqueduct, and the second, the Hill View reservoir, at Mile 92, just before the city is entered.

The Kensico reservoir is on the Bronx River, which is already utilised for the supply of New York, and consists in an enlargement of the existing reservoir so as to hold 29,000,000,000 gallons, or fifty-eight days' supply of the flow of the aqueduct, an unusually large provision. Although only a service reservoir, it holds more than twice as much as the Vyrnwy reservoir for the supply of Liverpool. The water is to be impounded by a masonry dam 170 ft. in height above the river bed, the foundations being carried to a maximum depth of 130 ft. below the river bed, and its total length is 1,830 ft. Its maximum thickness, where founded on the solid rock, is 228 ft., so that it is a much larger structure than the Olive Bridge dam, and it is generally of similar construction to that dam, except that the downstream face is to be finished with granite.

The reservoir will be of irregular shape, dotted with islands, and much thought has been given to its æsthetic treatment. As it was built inside and upstream of the existing Kensico embankment, the headwork of the Bronx aqueduct, the existing reservoir had to be drained and two large temporary lakes formed, having a total capacity of 5,000,000,000 gallons, in order to keep up the Bronx supply. These lakes were formed by means of earth embankments with timber core walls from 40 ft. to 50 ft. high, and each about 470 ft. in length. There is a good deal of swampy ground which will be within the reservoir area, and these areas are to be covered with clean soil and sand. It is expected that this work, which was let in September, 1910, will take ten years to complete, and therefore the Catskill aqueduct is so arranged that the water can either be discharged into the reservoir or can flow straight to the city by means of a by-pass.

HILL VIEW SERVICE RESERVOIR.

The Hill View service reservoir will hold 900,000,000 gallons, and is for the purpose of equalising the fluctuations in demand for water. The Catskill water can either enter this reservoir or can be carried through it by means of a conduit 12 ft. in diameter constructed in a wall, which divides the reservoir into two partitions.

The reservoir is entirely artificial—that is, it is dug out—and the excavated material deposited in the surrounding embankments, the depth of excavation, which is in glacial boulder till reaching a maximum of 45 ft., and the total excavation amounting to about 2,900,000 cub. yds. The banks have no core walls, and consist of an inner embankment of carefully selected material rolled in 4-in. layers brought up to above water-level, and an outer embankment resting against and covering this special embankment.

The absence of core walls is unusual, but no doubt the nature of the material, the way in which it was spread and rolled, and the care taken in stripping and in making a good connection between the bank and the original ground was considered to be a guarantee of its watertightness, seeing that the depth of water was only 45 ft.

The complete cost of this gigantic scheme cannot yet be determined, but there is no doubt that it will be carried out at a very reasonable figure, considering its magnitude. Although the aqueduct carries 500,000,000 gallons a day, whereas the Croton aqueduct carried only 300,000,000 gallons a day, it has only cost about 10 per cent more per foot run than the Croton aqueduct.

The number of men employed on the contractors' forces reached a maximum of between 15,000 and 16,000 in the year 1910. This does not seem a large figure, considering the size of the work, and it is to be accounted for by the fact that machinery was used wherever possible to supersede hand labour. The wages varied from about 8s. 6d. paid to general labourers to 16s. per day for skilled labour, and the actual contract prices at which the work was let do

not differ materially from those obtaining in this country just before the war.

A very large engineering staff was employed, working under the direction of Mr. Waldo Smith, the chief engineer, reaching a total of over 1,300 men in the year 1910. Mr. Waldo Smith had also a board of consulting engineers to assist him with their advice.

BURSTING OF WATER MAINS.

THE POSITION OF HIGHWAY AUTHORITIES.

At the last meeting of the Association of Municipal Corporations, held at Caxton Hall, Westminster, a memorandum by the town clerk of Ealing, on the subject of the bursting of water mains and the legal position of highway authorities in the matter of the reinstatement of damaged roadways, was presented in a report by the Law Committee. The injustice of the existing law within the area of the Metropolitan Water Board, having regard to the fact that that authority's obligations outside the county of London differed from those within the county, was commented upon by the committee, and the opinion was expressed that the same principle should operate throughout the whole of the board's area. The memorandum is as follows:—

(1) The position of water undertakers and local authorities outside the London Metropolitan area who act as surveyors of highways has recently been brought into prominence in the western part of Greater London by incidents which have occurred in the urban district of Chiswick and the borough of Ealing respectively.

(2) In Chiswick a few years ago a water main of the Metropolitan Water Board burst, causing damage to the highway that cost £119 12s. to repair. After a great deal of pressure had been brought to bear the board eventually repaid this amount to the urban district council, but as an act of grace only, the engineer to the board informing the engineer to the council that "no further payments would be made in respect of similar damage in the future."

(3) In the early part of this year a 30-in. main of the Metropolitan Water Board burst where it passes under the main road in Ealing, leading from London to the West of England, known as the Uxbridge Road, tearing up the highway and the tramway track and dislocating the traffic.

(4) The cost of repairing this amounted to £304 4s. 8d., including £29 3s. 8d., the cost of opening and reinstating a part that was opened for the board at their request to enable them to get at a part of the main requiring repair that had not been exposed by the action of the water bursting forth from the main. This latter amount only the board has agreed to pay, though an endeavour was made to get them to pay the whole of the amount, as they did in the case of Chiswick, they decline to do so. They state that they do not see their way "to depart from their statutory position that, where damage to the roadway results from burst mains, and the board are not guilty of negligence, the board will reinstate so much only of such road as they are by law liable to repair."

(5) It is, however, considered that in such a case the local authority should not be at the mercy of the water undertakers, who in the area of the Metropolis are liable to a penalty if they do not repair damage to a highway caused by the bursting of a main.

(6) This liability arises under sec. 112 of the Metropolis Management Act of 1855, which is as follows:—

"In case any part of the pavement of any street be sunk, broken, injured, or damaged by reason of the breaking, bursting, or want of repair of any pipe belonging to any water, gas, or other company, it shall be lawful for the vestry or district board of the parish or district in which such pavement is situated, if they deem it expedient so to do, to cause notice to be given to the company, to whom such pipe is supposed to belong, forthwith well and sufficiently to repair and make good such pavement, and if the company to whom such notice is given do not within forty-eight hours next after such notice take up such pavement and well and sufficiently repair and amend such pipe, and cause the ground to be well and sufficiently filled in and rammed down, and the said pavement to be relaid and repaired to the satisfaction of the vestry or district board, then such company so offending shall for every such offence forfeit and pay any sum not exceeding twenty pounds."

(7) It is obvious, however, that a penalty of £20 is inadequate to meet such a case as either of those before alluded to, and a clause such as appears in many private Acts with reference to damage done by bursting of waterworks, but applicable only to damage done to highways by bursting of pipes or mains, is what is desired.

(8) An opinion is quoted that without special enactment a claim for damage to a highway by a local authority against a water undertaker caused by the bursting of a main would not succeed unless negligence could be proved. (*Green* v. *Chelsea Waterworks Company*, 70 L.T.N.S., 547; *Snook* v. *Grand Junction Waterworks Company* [1886], 2 T.L.R., 308; and *Dixon* v. *Metropolitan Water Board of Works* [1881], 7 Q.B.D., 1,418.)

(9) Even if there had been any negligence when the main was laid, or in the maintenance thereof, in 99 cases out of 100 proof would be impossible.

(10) Precedents for the recovery of damage done by the bursting of reservoirs, aqueducts, pipes, or other works constructed or maintained for the purposes of the special Act within the locality where the construction of a reservoir has been authorised, are contained in the following Private Acts—viz.:—

Manchester Corporation Act, 1879.
Birmingham Corporation Act, 1892, section 46.
Newcastle and Gateshead Waterworks Act, 1894.
Sheffield Waterworks Act, 1853, sec. 58.
Agreements scheduled to the Sheffield Corporation Acts of 1896 and 1907.
Barnsley Corporation Waterworks Act, 1896, sec. 33.
Bury Corporation Waterworks Act, 1889.

(11) A precedent providing for compensation to the county council and district committees thereof for all damage, &c., in consequence of the bursting or giving way of the reservoir, "or of the conduits of lines of pipes by this Order authorised, and of the flooding that may be thereby occasioned," is contained in sec. 31 of the Arbroath Corporation Water Order Confirmation Act, 1905.

(12) As regards a county council, it is difficult to conceive that they could be damaged otherwise than in respect of injury to highways.

A similar provision is contained in the Dundee Water Order Confirmation Act, 1905; sec. 17; also sec. 14 of the Stockport Corporation Act, 1905; sec. 39 of the Lincoln Corporation Act, 1908; and the Pontypridd Waterworks and Tramroads Act, 1908.

(13) A clause somewhat as follows is suggested: Any person, company, or other body authorised to lay and maintain aqueducts, mains or pipes for the supply of water, or mains or pipes for the supply of gas along, over or under any highway within the area of a local authority in whom the said highway is vested, shall make full compensation to the said authority for all damage and injury, losses and expenses whatsoever which the said authority may sustain by reason or in consequence of the bursting or giving way of any such aqueduct, main, or pipe.

It was moved—(*a*) That the recommendation of the Law Committee relative to damage to highways outside the Metropolis caused by the bursting of mains belonging to water, gas and other undertakings be dealt with by the council after they have had a report upon the matter from a special committee to be constituted of representatives of local authorities who are members of the council, but are not themselves undertakers for the supply of water or gas. (*b*) That the said committee be now selected."

The motion was declared not carried.

A Surveyor's Dilemna.—At last Saturday's meeting of Retford Rural District Council the surveyor reported that for the parishes of Babworth, Bothamsall, and Elksley, he had not a single roadman left, and he had to bring in labour from other places. The contractors for the supply of road material had given notice that, as the War Office had taken over their wagons and the railways would not convey slag at the present time, they were unable to supply material. It was decided to appeal for exemption for roadmen who were doing half time on farm work.

"THE SURVEYOR" SPECIAL ISSUE.

The Special Annual Issue of "The Surveyor" will be published on January 26th, and readers who propose to accede to our request for a short statement, for inclusion in the number, of the works projected by their authorities for 1917, will greatly oblige by making their return as early as possible. All other material, and particularly matter accompanied by illustrations, should likewise be forwarded without delay to ensure its appearance.

A Survey of Municipal Engineering.

By EDWARD WHITWELL, F.I.S.E., M.S.A., Engineer and Surveyor to the Abersychan Urban District Council, Lieut. R.N.V.R., President of the Institution of Municipal Engineers.

[Inaugural address to the Institution of Municipal Engineers.]

It is incumbent upon me to make my apology to you for my absence from the meeting at which the announcement is made of my election, by the members of the institution, to the position of president for the ensuing year; and my absence abroad, being one of special duty in the service of my country, will, I am sure, be excused.

In accepting the office of president of this most important institution, let me hasten to say how reluctant I was to allow my nomination for this premier place; how difficult I realised it would be for me to follow in the wake of the past-presidents, the first engineers of the day—and no institution has been so fortunate in its selection of presidents as this has hitherto—and how deeply sensible I am of the very high honour which has this day been conferred upon me. I only wish that I could have had the pleasure of being with you and of participating in the discussion of the very valuable papers which are to be read during the meeting; but, like most men of my age, I have responded to the call of my country.

For the third time you are to receive a presidential address during the great war, and, as on each occasion previously, so now is breathed the great hope that before a fourth occasion occurs a means will have been found to secure a just and lasting peace. Like other great institutions, you have contributed to Britain's wonderful and mighty Army men without whose success could never be achieved; men who in civil life were leaders of her engineering faculties, and who are now, from private to general, silently, nobly, and heroically striving together to reach the inevitable goal of victory, a victory which shall remove from Europe the possibilities of that menacing militarism which always finds its beginning in peaceful defence, but its end in frightful offence. Your Roll of Honour carries a great percentage of the names of your members, probably a greater percentage than any other institution in the land; and, sad to say, there are upon it the names of men who have sat by our sides, and who have laboured with us for the advancement of the sciences of engineering, who to-day lie cold on the field of battle. We mourn with those who mourn for them, we pray that they may find comfort, knowing that they have not died in vain. Our brothers are numbered among the nation's heroes, and they would not have chosen a less noble end while England's honour was at stake. We miss them from our counsels, and as England is richer by their noble sacrifice, we realise that she is poorer by their early death, for they counted among our most brilliant and learned members. Some of them, had they been spared to better purpose, might have served England to better advantage than the greatest heroism of the war.

We are now passing through the third year of hostilities, hostilities commenced to right a great wrong, a wrong which no nation in honour ever committed; and these hostilities continue while the accumulating wrongs, which commenced with the sacrifice of a comparatively defenceless nation, augmented by the Lusitania, Egypt and Belgium crimes, cry more loudly for vengeance due to-day, and strengthen the nation's determination to exact full reparation and so shatter for ever the detestable god of militarism which our enemies have worshipped for so many decades. And the heart of every member of this important institution is with the Government in the laudable and honourable task.

THE INSTITUTION OF MUNICIPAL ENGINEERS.

One of the innovations which marked the inception of the movement was the introduction of its valuable work to the smaller centres of population by the holding of many of the meetings in their midst, the annual meeting being held in the town from which the new president hailed; and this year an exception has had to be made to this practice because of the absence from the country, and the meeting in consequence is held in London, it being considered that London affords the best general facilities in regard to the great majority of members. This is one of the many consequences of the war, and one which, as a local institution we must suffer in silence.

As a member of the institution since its inception I have observed with increasing pride the healthy growth of its membership list. In the early days keen was the antagonism and scathing the criticism brought to bear against the new body of men which appeared to rise from the sea of engineering, men ranking with the first engineers of the day, and men hitherto unknown in the world of professionalism, men who were silently and efficiently steering the health destinies of important municipalities, but whose eminence and efficiency were overshadowed by the apparently greater and more obviously successful brother who was largely responsible for guiding the destinies of a kindred community.

Some of the criticism levelled at the institution at its birth was justifiable; part of it arose from a spirit of antagonism only, and had no healthy basis; part of it—though very little—arose from petty jealousy; but all of it has been experienced at the birth of every institution, and has been just as applicable to each of them as it has been to ourselves. It has been of great moment in shaping the destiny of this body, and has done more to produce the present healthy list of loyal and able members than any silent antagonism could have done. To-day as great a care is taken in the selection of its members as is taken by any other institution of equal importance; its examinations are the most practical in the municipal world, and in the result it is becoming recognised in the engineering world as a valuable training ground for coming engineers and the home of many of the most eminent. That there was a need for its existence has been proved by the great work its members have achieved; that it continues to exist after so many years is proof of its utility; and that it will continue to fill a void in the sphere of engineering is certain so long as every member constantly aims at the same high standard of efficiency, to carry out the aims and objects for which the institution was created, and to remember that his quota, however great or however small, is just as essential to its useful existence as it is to himself.

The institution continues to grow in usefulness and prestige; its membership list is even more satisfactory than it was a year ago; the council month by month scrutinises more closely the applications for admission to its ranks, the members contribute more loyally their papers and subscriptions; its past-presidents most faithfully continue their keen interest and very valuable assistance; the secretary pursues his tasks assiduously and faithfully; all these important factors are combining in building together an eminence in the engineering world which ranks in importance and utility with other institutions of a kindred character. To strengthen the institution, to make more firm its purposes, to bind the members more tightly into one great body, having for its object the welfare of its fellow-men, should be the aim of every member. No member should fail in these duties, if the institution is to pursue its healthy growth, increase its great usefulness, and add to its already enviable prestige.

SECURITY OF TENURE.

No presidential address can be complete which omits from its remarks the one vital theme, security of tenure. Just as it is necessary that a fruit-bearing tree should have its roots securely and firmly spread at the spot in which it has to grow and be fruitful, to prevent sudden squalls from limiting or abruptly ending its life of usefulness before that life has passed that stage, so should the engineer, who yearly continues to grow in usefulness and knowledge, to the benefit of the community he serves, be protected from the sudden local storms of indiscretion—and often malice aforethought—by having his office shielded and his position firmly rooted in the soil of permanent government. A tree which is insecurely rooted must always fail to yield its full measure of fruit, because of its struggles to retain its grip on the soil, and so it is with the engineer when all that is best in him is crushed by the unscrupulousness of slandering and libelling members who, though really not numerous, are generally very serious and determined in their animosity, on account of a fancied grievance, because the engineer has had to pursue unflinchingly the

straight path of duty. It is because this institution believes that men can give their best services when removed or protected from these vitality-sapping and incentive-lowering elements that it stands for security of tenure; because it too surely realises the inability of an engineer, however honest, highly intellectual, and accomplished he may be, to survive the really determined municipal opponent; and because it knows that this absence of security to one health official in the public service is quite as illogical as security for the remaining health officials is logical. Only one real argument has ever been advanced against the consummation of this ideal—that is that there are some appointed to public positions who lack competence—and protection for them would be injurious to the service; to which I would reply that every authority under the present system offers its appointment, at a salary it fixes itself, to the best applicant, and where it has failed to secure competence it will only be by reason of (*a*) offering such an inadequate salary as not to tempt a gentleman with any competence; (*b*) selecting a popular candidate instead of a competent one—two oft-recurring instances, to judge by the news of appointments. There is only one way to secure the removal of this public health inconsistency—namely, for every municipal engineer to unite in an effort to secure the passing of a Bill which will place the appointment, the payment, and the dismissal of officials connected with the public health in the hands of a central authority, and toward this ideal it is the duty of this institution and every member to aim.

SECURITY OF SERVING MEMBERS.

It is necessary to make some reference to the gallant members who have gone forth to battle for their country. I am not aware of there being a single member of the institution who failed to respond at the earliest opportunity to his country's call, and though few, like the majority of Britons, possessed any military instinct, they all possessed that love of country which prompts men to say, "Who lives if my country dies?" And the institution has great reason to be proud of them, their authorities are proud of them, and the Empire thanks them. But what of their homes, their mothers, their wives and their children? In every instance a loyal community said "Go, and you shall not suffer; your income shall be as before, and your place will await your return." That was two years or more ago, and still the war goes on. This institution appreciates to the full the deep loyalty of the municipal authorities of this country, and it believes that as the war lengthens in time so will the determination of the municipalities grow in intensity to keep faith with those who will return. As England's pledge to others was honourably kept, so let the authorities' pledge to those Englishmen who went to keep England's pledge be honourably kept.

MECHANICAL TRANSPORT.

Like all other departments in which the engineer exercises his activities, this is furnishing an ever-changing state in which his originality, research, and assiduity find ample scope. A few years ago the leading question was animal traction *versus* steam traction, but the wonderful developments which have taken place in the mechanical world have changed this completely, and now the controversy is entirely related to the form that mechanical traction shall take, whether it shall be steam, internal combustion, or electrical power. Like all other very old institutions, the use of the horse dies very hard indeed, and one fully expects to see, in another decade or two, a few authorities still using this animal for all classes of work with a much concentrated Rip Van Winkle air. That at the present moment there are many works in which the horse is more economical than the motor is very evident; but, one by one, with increasing experience, and with the numerous inventions tending to improve the power unit, they are fast appreciably lessening, and in all probability in a few years' time not many authorities will be found with unqualified allegiance to animal traction. At the present stage the consensus of opinion is that for very short journeys the horse still reigns supreme economically—though the electric vehicle is rapidly overhauling it—while for long journeys the power wagons are admittedly more efficient and economical.

As one who has made a keen study of this question, and has carried out numerous experiments with internal combustion and other engines, I am convinced that mechanical traction, both in theory and practice, has more than justified its being preferred to other forms of traction, and should be much more general than it is to-day; only the conservatism of the English character has prevented its full application. To those engineers who are about to change from the old system to the new, let me emphasise how necessary it is to be careful in selecting that type of vehicle which best suits the district. Do not be influenced by first cost when considering the power, and remember a hilly district requires a vehicle considerably more powerful than a flat district if its work is to be equally well done. Again, if the motive power is a petrol engine, an increase in the number of cylinders is far more preferable to an increase in their size, and will lead to smoother running, better hill climbing, less gear changing, and, of course, reduced wear and tear. To those who have municipal electrical supplies, electric vehicles are well worthy of consideration, as, with the later improvements in this department, electric propulsion is proving to be a very keen rival to the best known other forms of traction. The initial cost of an electric vehicle is higher than that of the other forms, and the available speed is less, though the latter will be found ample and quite sufficient having regard to public safety, while at the same time quite equal to legal limits. Its running costs are found to be lower; it is noiseless; it withstands the strain of starts and stops better; has fewer moving and wearing parts; is quick in acceleration without the sudden jar on gears, &c., while in control and maintenance it possesses none of the difficulties of the petrol engine. Of course, great advances are being made in the petrol-engine world, resulting in the production of types of engines which are revolutionary in character; and this has been chiefly due to the exigencies of aerial warfare. Comparing it with pre-war days, we find the weights about one-half of those which held previously, the efficiency nearly doubled, and the difficulties of control and maintenance considerably reduced.

Other developments are taking place, with which I am identified, to which it is not possible to refer at this stage, but of which some mention will be heard later when the results of much experimental research are disclosed.

While I do not wish to dogmatise, I venture the opinion that the traction vehicle of the future is more likely to have electrical power by reason of its being cleaner, less noisy, and more simple to maintain than any other; and there is every probability that it will be equally cheap. Its only rival will be the petrol engine, which, owing to the requirements of the war, has increased in efficiency by leaps and bounds. The steam tractor, to my mind, already has little place on the highway, and will in all likelihood soon be a relic of the past.

TOWN PLANNING.

Probably one of the most important matters exercising the municipal mind is that of town planning. In the past the prevailing selfishness of the great landowner has so permeated the mind of the lesser owner that the most minute exercise of public control or direction of privately owned land has been regarded as a wicked interference with the rights of the free-born Englishman, and in the result villages, small towns, and great cities have been laid out in a manner unworthy of the traditions of a great people, and still more unworthy of an intellectual community. Fortunately, a great change is taking place; the people are beginning to awaken to the value of beautiful surroundings, quick transport, and social amenities, and in place of the narrow, sunless thoroughfares, the gloomy environment, and the selfish disregard of the neighbour's welfare, is springing up the national realisation—alike in the landowner and the landless—that the happiness and prosperity of a nation lie in securing to its people the full measure of Nature's gift. That we are far from reaching this high-water mark is still lamentably apparent, however, and this is chiefly due, I think, to the inaccurate perspective of the municipalities in general, who, with limited vision, see only the immediate capital outlay, and are blind to the fact that the principal and interest are returned a thousandfold in the shape of health, happiness, and prosperity of future generations. The full, proper and necessitous solution to the consequent problems is only to be found by generally applying the powers already in existence on this subject, by sweeping away the adoptive clauses, simplifying the procedure, granting greater powers to the local authorities, and seeing that full advantage is taken of them.

HOUSING.

Year by year great strides are being made in this direction, and already one is inclined to be unsettled by the reflection that so much has been done in the last decade and so little for general use previously. Slowly, but surely, the conviction is growing that the

provision of healthy and pleasant environment about the home, with all the requisites for the good health of the people, is not to-day an act of beneficence on the part of the more fortunate brother, but a Christian and communal duty, which cannot help but be productive of marked improvements in the moral, physical and industrial well-being of the nation. That no individual should have a legal right, for his personal monetary profit, to condemn his less fortunate fellowman to live in a home and surroundings inimical to that man's and his family's well-being is now being more clearly recognised—yes, being recognised just as clearly as that the individual is really by his action not only helping to sap a future generation's vitality, but is assisting his neighbour of a robust, virile manhood.

That slumdom exists after so many generations of civilisation is creditable to neither civilisation nor the country which possesses it, and that this country is at last awakening to the great canker in its midst marks the most commendable discovery of our day. Too long has the false ideal of providing a man with these necessities of life, according to his means, been clung to, instead of the ideal conveyed by its converse. Let the converse be the ideal of the nation, and the progress made during the last decade, great as it has been, will be infinitesimal compared with that of the next. The welfare of a nation depends on the health of its people; hence, to permit of the existence or encouragement of that which is inimical to the people's health is tantamount to race suicide. One hears so much of the so-called housing problem, a problem which is not so much one of housing as of means, and so long as the genius of the property owner, whether municipal or private, is expended on how to erect dwellings according to the means of the tenant, so long shall we have this housing problem; it will never be solved on these lines. Once turn to the real aspect, once understand that correct and sensible housing accommodation—which must include all the essentials for health and all the securities from disease—is as vital to the well-being of the nation as it is to the individual, then, and then only, will it be realised that, instead of building to fit the means, it is necessary to fit the means to the building, to see that every individual has the means and the right to healthy and bright surroundings. In other words, the housing problem as we know it can only be solved by either enlarging the means of the workers or by the State contributing sufficient sums to make up the difference. As the former is, for economic reasons, almost impossible of attainment without social upheaval, it is evident that the latter is the only way, and the sooner the nation realises it the better it will be for the well-being of the English race in general.

TRANSIT FACILITIES.

How much the growth and really healthy expansion of a town depends upon its transit facilities is seldom realised in a municipal sense, and consequently in almost all districts these are left at the mercy—or shall we say to the prize of the speculative instincts of our more wealthy fellow-men. In the result we see communities extending themselves from the centres of industry in a much restricted manner, each individual mentally measuring the distance from the site of his proposed dwelling to the nearest tram-it point, and in turn each landowner crowding as many promising plots into an acre of ground as will tempt the greatest number of clients to his own monetary advantage. That there is something radically wrong in our system of municipal expansion is strikingly evident; that the vision of our inevitable growth of population is lamentably restricted is perfectly clear; and that the results are both wasteful and costly measured in the wealth of our manhood and the virility of our people does not admit of the slightest doubt. If only a broader and more extended view were taken, if the assessment of a district were as carefully provided for as the assessment of necessity be done when preparing for supplies of water, light and other necessities of life, then, but never sooner, would success. Is not this just what should be done?

Arguments can readily be advanced against the general provision of transit facilities, such as the sparsely populated growth of communities, the difficulty of transit and the expectancy, often, of engineering undertakings partly providing them, but these are only arguments and do not remove the necessity for the adequate provision, but only tend to point the cause. Where we reflect that the lack of their provision is often most due to the authorities in general not being the pioneers in enterprise, and we realise that generally speaking it is going to be found that the need is not known to have existed certainly before taking the step, we must conclude that nothing has lent itself more to the neglect of the healthy suburban and rural life and promoted the growth of the cramped, confined, sunless and airless existence than this mistaken policy of municipalities leaving speculative capital to provide that which is essential. Surely those things which help to build up a strong, healthy nation of contented people it should be the nation's obligation to provide; it should not be left to the speculative tendencies of a few. There was some municipal excuse for inaction a few years ago, but now when an authority can control the future development of its district, can allocate its sectional usages, restrict its malformation, and secure its correct design, there is none. It is only when an authority realises that that which benefits the nation as a whole is that which, under our present system of local administration, benefits its own people, that real progress is being made.

HIGHWAYS.

This very important part of the engineer's work looms more and more largely in the people's mind, and is one for which in its present transitory stage it is not so easy to lay down immutable laws as most laymen imagine. With the ever-changing and varied types of vehicle, which now use almost every kind of highway, it is found that it is impossible to lay on any one highway that kind of surface which is suitable to all, and it is fast becoming an accepted fact that a highway must be constructed with a surface that will suit best the major portion of the traffic which it has to carry. Again, it is found that this solution of the problem is not in itself conclusive, for other difficult factors immediately present themselves in the form of position of the highway, the physical characteristics of the district over which it passes, &c.; while the question of cost generally closes the door, in the municipal mind, on the best and most suitable forms. One thing is really most evident, although often overlooked by the carping critic of highways, and that is, that unless an adequate foundation is provided to any form of highway, good surfaces are the exception and not the rule; and how many of the existing highways, unless they have been constructed or reconstructed during very recent years, possess this adequate foundation? Another fact which must be understood is that the best forms of highway surface, given that other conditions are complied with, are undoubtedly the most satisfactory and the most economical, though much more costly than the old forms in initial outlay. Of course, it must be realised that the best form does not necessarily mean the most costly, but rather the most efficient, having regard to durability, imperviousness, noiselessness, and self-cleanliness. Personally, I regard the keeping of highway statistics as being as essential as the knowledge and use of the best materials, for without the former the use of the latter depends too much on mental observation and memory; but how many authorities realise the importance of this sufficiently to provide staffs adequate for effectively keeping such data?

Much controversy arises from time to time as to whether the main highways of the country should not be nationally controlled. There is much more to be said in favour of this than there was a few years ago, before the advent of the automobile, and when traffic was almost entirely local. Without doubt there are many arguments to be advanced in favour of this proposal now, particularly from those who use the roads in a national sense, and one is inclined to agree that if any change is made this should be the one. At the present time many urban authorities and almost all larger municipalities control the highways in their district which carry the through traffic; while, as is well known, the county councils control the remainder. In many instances the view is held that the county authorities are the proper authorities in any event. I do not think that any change should be made in this smaller sense, but rather in a national sense, as by that means the whole treatment of the main highways would be free from local influence; they would be more uniformly kept; their state, conditions and statistics more generously noted than when the local rate provided the means; and so they would, as is only right and reasonable, become a national charge.

In view of the ever-increasing shadow of national control, I think the contribution of a paper by some member of the institution on the arguments for and against the suggestions would be timely and a most valuable addition to the institution's records.

STREET IMPROVEMENTS.

One of the most striking lessons of municipal short-sightedness is provided by the realisation of the enor-

mous sums which have to be spent annually to widen, straighten and generally improve our existing highways, or to make new ones through congested areas. There is not a single community in the country which is not having to pay most heavily for the lack of foresight or the niggardliness of a past generation—and in many instances for the present one—and in some cases the sums having to be paid for properties which previously could have been acquired for a trifle are almost staggering. In the writer's own experience, he has found authorities having to provide 30 per cent of their revenue for this purpose, and when one realises this and looks to the experiences of large towns like Liverpool and Sheffield, one is surprised to find any sign of lethargy in seizing upon the provisions of the Town Planning Acts in order that future generations may be spared the enormous waste which is now being suffered.

Of course, it is evident that some sums must always be provided to remedy that which human judgment could not foresee, but there is no excuse for an authority which neglects to provide for a future generation that which the future generation will need in its turn, and as there is no surer, easier, or more economical way of doing this than by the preparation of a town planning scheme—a scheme which will in the present generation justify its execution a hundredfold—one must conclude that it is municipal folly not to take advantage thereof, and deplore the national blindness which prevents it from being demanded.

SANITATION AND INFECTIOUS DISEASE.

Everyone knows that dirt and infectious disease are synonymous terms, and although it was only during the conclusion of the last century that this became an accepted fact, some wonderful strides have since been made in the efforts to obliterate them from our vocabulary. That we shall never be perfectly free from all forms of infectious disease is almost an axiom, but that it can be reduced from the enormous proportion of human ailments which it forms is perfectly clear; in fact, were it within the province of this address to produce figures showing the progress made during the last forty years, their inclusion would provide some very striking contrasts.

Disease prevention is one of the departments in which the authorities are far ahead of the people in their knowledge of its importance, and have enacted by-laws and regulations which, if sensibly followed, would do much to stamp out entirely almost all preventable diseases. Unfortunately, the people are far behind; some of the lower classes are living in a sense far behind the Middle Ages, while others appear most reluctantly to drag themselves along far from the realm of precaution. It is not that they do not suffer for it—they do; and, sad to say, many others too who would do those things which are best. The authorities cannot be blamed, because they are performing their tasks often in the face of a diametrically opposing obstinacy which regards public interference as something akin to despotism; and is not an Englishman's home his castle? Much progress will have to be made in the education of the masses before infectious disease is practically stamped out, and I am rather inclined to the opinion that the most economical way of achieving the latter object is for the Education Committees to give sanitation an important place in their curriculum. If as much care were taken to instil into the youthful mind how to maintain health as is taken to instruct it in much less vital matters, hundreds of thousands of pounds would not be wasted in remedying that which could have been avoided, and more than that gained by the better health of the people. As is well known, many thousands are wasted in disinfectants to satisfy the sentiments of people who are in the habit of crying "wolf" at all times, and there is hardly a sanitary engineer but who is amazed at it. But what can be done? Public sentiment must be satisfied, and so tons of disinfectants are thrown annually in the drains and sewers of the country on the off-chance that there may be a disease germ with its mouth open waiting to be poisoned therein; and yet infectious disease is almost unknown among the sewermen of our great towns and cities; further, we know how the presence of disinfectants interferes with the natural processes of sewage purification, and makes that purification more costly and difficult.

SEWERAGE AND SEWAGE DISPOSAL.

The effective advances that have been made in this department during recent years call for much congratulation; but, great as the advances have been, many more are necessary before we can rest content in the belief that the problem has been finally solved. In the matter of sewerage, I think it may generally be conceded that we are nearing the final disposition of all doubtful problems, and if other departments of public service, which are equally vital to the welfare of the dwellers, were on as satisfactory a basis, our death, infectious disease, and kindred rates would show a much more satisfactory condition of things.

Perhaps the most oft-debated matter in connection with sewerage is the disconnecting trap, the evolution of a day of royal and national grief, and which, though eminently effective in its primary purpose, is woefully dangerous in other directions, and responsible for more than 90 per cent of the evils in connection with modern drainage. Some day we shall discover that at last bureaucracy has bowed its head to the consensus of professional opinion, and then, a few years afterward, we shall pause to wonder how such an illogical contrivance, in which the remedy intensified the troubles, could have survived so long.

While in the department of sewerage great improvement has been effected, it is unfortunate that so much real progress remains to be recorded before the problem of sewage disposal is properly solved. Experiments extending over long periods have been made; commissions have sat for years and reported years later, largely with good results—although without full effect, because some of the information was almost out of date by the time it appeared, and also because some of it lacked the definiteness which a national commission should provide; statistics have been compiled which, owing to the varying circumstances in each case, lose much of their value when setting standards therefrom. And yet, in spite of these things, we seem to be far from effecting the purification of sewage satisfactorily, and at the same time economically, on lines applicable to all districts. The absence of standard degrees of purification is another fruitful source of difficulty, and in my own experience, difference of opinion among engineers, the weakness of a county council, and the indecision of the Local Government Board, led to the useless expenditure of many thousands of pounds in the promotion of rival Bills in the House by different local authorities for the drainage and sewage disposal of the same area. It is when one realises these things that one has the truest conception of how far we are from accurately defining the correct lines for success, and, further, it is such instances as the one given that do more to call professional attention to the unsatisfactory condition of the question, with its consequent wastage of public money, than the multiplication of costly experiments can ever do. The engineering world, however, owes much to the courageous pioneers of sewage treatment, and though the war has set back the clock for a period, one is inclined to the belief that their successors are approaching the question from much more satisfactory standpoints than formerly, and that more gratifying results will accrue in the near future.

(To be concluded.)

Women and Road Work.—Women are being employed on highway work at Walton-on-Thames.

Substitution Scheme for Municipal Tramways.—The Municipal Tramways Association announces that arrangements have been made with the War Office for the establishment of a substitution scheme applicable to tramway undertakings for dealing with employees of military age.

Water Supply from Melted Snow.—A project is being undertaken in the State of Arizona by which an arid desert district is to be watered with the melted snows of a neighbouring mountain range. The scheme involves a collecting ditch situated in an impermeable clay stratum to intercept the water flowing down the mountain slopes, with two storage basins evolved from old volcanic craters. Pipe lines totalling 90 miles are to be laid to serve the area. The capacity of the two reservoirs amounts to 920,000,000 gallons, and the total annual supply will be 2,000,000,000 gallons. The distribution will take place entirely by gravity. The pipes are of sheet iron, each length having a bead or ridge stamped around each end. The end of one pipe is heated to enable it to slip over the adjacent pipe, with the hollow bead of one fitting over the raised ridge of the other. On cooling, the pipes are locked together. The total cost of the installation is estimated at £25,000. This will solve the difficult problem of supplying water in the district, where all potable water has to be drawn in by rail in tank cars. So little water was available that in some towns the effluent from treated sewage was used to sprinkle lawns and in boilers.

Practical Road Work: A Day Out of the Office.*

By GEO. RODLEY, District Surveyor, Norfolk County Council, North Walsham.

The writer of this his first paper, hopes that the opinions and ideas set forth therein will, if not quite meeting with general approval, be of some little practical service to a few of the members and students of our profession.

Most of my details are given from an "outside" rather than from an "office" point of view, and thus may be, as I hope, of great use to those assistants among us who get very rare opportunities of seeing the actual work carried out. In many offices the assistant surveyor and pupils have the bulk of their time taken up with work for which an office boy should have been engaged, such as correspondence, wages accounts &c. It is a red-letter day if they can go round the work occasionally. To such I would say: "Come along; let's go round the jobs to-day—leave your booking for another day."

FOOTPATH FLAGGING.

Now, the first work we come to is a piece of new footpath flagging—one side of the street with natural flags and the other side with artificial flags. We will see the artificial flagging first, because a gang of men is at work on each side. The flags are set up in stacks on their edge, and the sizes are 2 ft., 2 ft. 3 in., 2 ft. 6 in., 2 ft. 9 in., or 3 ft., according to the width of footpath, but all the flags are 2 ft. wide. The usual crossfall from back or building line in this class of work is ¼ in. to the foot, so that if the path was 6 ft. in width the back line would be 1½ in. above the level of the kerb. After the crossfall has been determined a chalk line is strung along the back showing the level of the finished flagging there, and the tradesman commences laying flags on a prepared bed of good hard, fine boiler ashes. His first flag is laid against the kerb, with ½in. lip above the kerb, and at such a level that a straight-edge placed on it will just touch on its underside the chalk line on the back, after the flag has been consolidated with a beetle, or mall. This is done until that course of flags is laid. Then the next course is laid so that there is at least 6 in. of break in the joints. That is to say, starting from the kerb the first flag in the first course may be 2 ft. 6 in. in length. Then the first flag in the second course should be either 2 ft. or 3 ft. in length. The best work is obtained by arranging the joints so that they are continuous "hit and miss." This is most pleasing to the eye. In bedding the flags it is usual to place a trowel of mortar under each corner, and then beetle the flag down carefully—more with a rub of the beetle than with a blow—until it is consolidated and true with the back line. In some towns the joints are afterwards grouted with cement and sand, and in others they are simply grouted with sand. For many reasons I prefer the latter system, especially in large towns where services exist for gas, water, electric light, &c. If the joints are grouted with cement and sand it often means that in taking up one flag five or six are broken.

We will now cross the road to the other men who are laying the natural stone flagging. The bed is prepared in the usual way, and the back line is set out in the same manner, except that it is usual to allow a crossfall of ½in. to the foot, so that a footpath 6 ft. wide would be given 3 in. of crossfall. The most practical way of laying natural flags is, in my opinion, to lay them as the rough-cut, not tooled or squared. The semi-skilled masons can square them on the road to whatever fine joints are required, and in laying flags to a gauge a great saving is effected. No tooling is required, the flags being laid according to the irregularities. Any that are twisted on the bed can be levelled afterwards by an apprentice sitting on a bag on the path.

STONE SETTING.

The next work we will see is the steam roller going on dry macadam. In this case the old surface may be torn into wheel tracks, and then the tracks are slightly scarified and fresh material put in to bring up to the proper contour with the surrounding surface, and well rolled and bonded. By common material I do not suggest rubbish, but old granite setts broken to about 2 in. gauge or granite spall roughly broken. The whole of these operations being spread shovelful by shovelful—not dumped down in cart-loads and levelled haphazard. No binding material should be added until the surface material is well rolled and interlocked. The binding material should be clean, but not too sharp. Only sufficient water should be used to work up a "lather." After the road has been left for a few days it should be spread thinly with chippings and dry-rolled. In my opinion, nothing less than a 2-in. stone should be put on in coating.

PATCHING.

It many times happens that, either because a roller is not available, or because the patches are not large or numerous enough to warrant a roller being sent a long distance, patching has to be done and the work consolidated by the traffic. I refer chiefly to pot-holes. Unless a keen watch is kept many men have a tendency to dump the patching material into the depression without scarifying it. By scarifying the old surface is toothed and will better allow the new material to lock into it. The patch should be left very little higher than the old surrounding surface, but in any case the edges should be feathered to the surrounding surface.

TAR-PAINTING BY HAND.

The success of this depends on securing the proper weather when carrying out the work. I have in mind a length of road I treated a few years ago near a railway station. Trains were running at very short intervals, and there was in consequence almost a continuous stream of taxicab traffic over this particular piece of road. The usual procedure had been to apply the tar over half the road, and as it was applied to follow up with chippings, and let the traffic over immediately. But when I treated it I put barriers across each end of half the road and barrels along the centre.

After horse-brooming and sweeping with soft brooms I commenced applying the hot tar on a warm day and treated about three-fifths width of the road by about 5 p.m., but applied no chippings during the day. I left the tar to "boil in" with the sun. When the men had finished applying tar their work was absolutely dull black—no shine whatever. I then told off four or five men to apply chippings. In the mean-time that tar had penetrated. In my opinion, by applying chippings immediately after the tar, and opening to traffic, that tar has no chance to penetrate, and the wheels of vehicles pick up the chippings and tar and leave a bare patch or streak.

Warning notices should be set out at least 100 yds. from each end of the work, with intermediate warnings at junctions to give sufficient time to enable fast traffic to slow up. The writer has seen many notices which even a pedestrian could only read by stopping a few seconds. In these times we must cater for the fast traffic in the matter of road signs and warnings by having them printed in bold letters and to the point, and in as few words as legally necessary. Instead of the usual warning, "Tarring in Progress—Cyclists Advised to Walk," I strongly advocate some such wording as "Beware! Wet Tar," in large white letters on a red ground.

Before tar-painting is commenced the road should be examined, and all depressions made good, either with tarred chippings, or thoroughly dry chippings rammed into a flux of tar, and then washed over with tar. This should be done two or three days before the actual work of tar-painting the whole surface is commenced. A great saving is effected by tarring all sharp bends or curves on dry macadam roads. When motors take these sharp bends there is always a certain amount of side-scrub with the tyres, and I have proved this tarring to be a great advantage and saving to the roads. The Norfolk County Council have done this for some years, and I would strongly advocate their system.

STREET WATERING.

This is one of the most important branches of the highways department, and unless under systematic control complaints will be constantly coming in from tradesmen. The town should be divided into routes, so as to avoid overlapping. A list of these routes should be kept in the office, and also a copy posted in the stables. The drivers soon "pick up" these routes.

* Paper read at the annual meeting of the Institution of Municipal Engineers [illegible].

and instead of having always to give the driver a list of streets, it is only necessary after a little time to say to him: "Oxford-street route," or "Borough-road route," as the case may be.

SNOW CLEARING.

In this, too, the town is divided into routes. But in the case of crossings near railway stations, works, &c., the men required are given to understand before winter sets in that they are to go direct to those points instead of going as usual direct to the depot for instructions. These men should be allowed to keep a shovel, scraper, or broom at home during winter, so that they can go straight to work. From the depot the permanent workmen are sent to different points with one or two "casual" men, and each gang starts in the most important streets and works outwards. The channels should be kept clear, so that in case of a quick thaw the water can get speedily away. The snow-ploughing routes should also be posted in the stables.

A rotary broom is of no use in snow clearing, but when a good thaw has set in, if it is set to work at the right time, has excellent results. Care must be taken that no further brooming is done if there is the least sign of a frost. It is much better for a horse to travel over frozen snow-broth cut up with the previous days' traffic than to face a road which has frozen on a smooth surface.

All snow ploughs and snow-clearing tools should be overhauled before the end of October, so that repairs can be carried out and renewals obtained before the snow comes.

GRITTING ROADS IN FROSTY WEATHER.

In this matter, too, a system is of supreme importance. Certain places in the town are always more susceptible to frost than others. Certain paths leading to works are unfit for work men and women to walk upon at 6 a.m. Roadways over bridges or near stations and wharves are not fit for a horse to be driven along. Where these places are known certain men should have instructions before the winter sets in as to their routes. Before November the job-masters, &c., in these localities are approached for permission to store a small quantity of grit on their premises (under cover). Certain of the workmen who live close by have instructions to go to these, the worst points, and commence gritting as early as possible. If for footpaths, he carries a pail full of grit and spreads it from his hand on the path. If for roadways, he uses a barrow and shovel. In the case of roadways very little grit is required; in many instances just two tracks for horses are sufficient. I have never experienced difficulty in obtaining permission to store the grit on private premises, because the job-masters feel assured their horses will have a good start out on a bad morning.

Instructions should be given to the foreman that if a severe frost threatens during the afternoon, one or two carts should be filled with grit and set up under a shed overnight, thus saving loading time in the morning.

FOUNDATIONS TO ROADWAYS.

These are to a great extent governed by the locality. In the ironworks districts slag is the best and cheapest material obtainable, and in the neighbourhood of stone quarries, rubble. All foundation material should be "paved" in by a sensible labourer by hand. The writer has seen tons of foundation thrown in with the shovel, and it has all had to come out again. Each stone should be paved resting on its broadest side and "tooth up." The interstices can be filled in various ways. The projecting teeth are nobbled off by one of the men and are knocked into the interstices. If more material is required to lock the foundation together, I find one of the best materials is old macadam, either ordinary or tarred, which should never be wasted, but kept in the depot for such purposes as this.

A good steam roller should be used and kept continually on the move. A good coat of hard boiler ashes should be spread over and brushed in. In all cases, whether the road is to be paved with setts or coated with macadam, the foundation should be finished to the same contour as the finished surface.

This walk round the work will, I hope, have been interesting to those who, in imagination, have accompanied me, and although there are one or two more works in progress time will not allow of a visit to-day. Perhaps some other time we will have another day out together.

When this war is over there will no doubt be such a great amount of work to be done on our highways that more opportunity will be given the assistant to get among it.

Since writing my paper I have noticed a "bull." I have presumably visited a tar-painting gang and the other gangs on the same day that snow-ploughs are out! This, I think, you will overlook. My idea in bringing snow clearing and gritting into the paper was because the season for this work is close upon us.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not curious to notice how Nature so often tries to thwart man's efforts to improve his surroundings? Do we not find an example of this when we read that recently the Legislative Council of Burmah has been obliged to promote a Bill in an endeavour to eradicate the water hyacinth, a plant, or weed, which threatens to choke all the rivers and waterways in that country? Is not the same evidence of Nature's desire to override everything observable in a smaller way when we see how on many of the waste pieces of ground, where buildings had formerly stood, in the heart of London, or in other large cities, wild flowers, weeds, and grasses begin in a very short time to spring up and grow profusely, if left alone? Where do the weeds come from?

* * * *

Cannot most engineers truthfully say when they have executed some work, "If the job were done over again many improvements could be introduced?" Was it not very bold of Mr. Rand to acknowledge this in a paper he gave on "The Oregon City Water Pipe Line," recently, and is it not evident to an observant engineer that this must be a fact in nearly every work that is carried out? Should we ever make much progress if this were not so?

* * * *

Did not Mr. Binnie, the new president of the Institution of Sanitary Engineers, delight his audience the other night with his inaugural address—which dealt in detail with the ancient water supplies of Rome and the modern water supply of New York? Was not the subject well chosen by an engineer whose firm is so world-renowned in connection with water engineering, and was it not full of information which will be interesting for all time?

* * * *

Is it quite fair to expect that all the money required for the necessary scientific research work in this country should be supplied by the Government, or, in other words, from the pockets of the already over-burdened taxpayers? Do not the manufacturers and traders derive enormous benefits financially whenever scientific research discovers some better or more economical method of production or manufacture, and would it not be more reasonable to expect that the manufacturers and producers should conduct their own researches at their own expense rather than look to the taxpayers for assistance?

* * * *

Is it not rather interesting to note that in the definition of a civil engineer in the charter of the Institution of Civil Engineers of the year 1828, the construction of roads comes first in importance on the list, and is placed before bridges, aqueducts, canals, and so forth? Is it not acknowledged that this old definition of a civil engineer holds good at the present time? If this is so, should not the road engineer be very proud that he should thus be placed in the front rank of the profession?

* * * *

Are not some very queer and original things done in America? As an instance of this, is it not interesting to read that in California a young live aligator is used to drag a rope through the choked sewers, and thus enable a chain to be dragged through afterwards in order to scour and cleanse them?

* * * *

Is it not evident from the extracts given in THE SURVEYOR of the 5th inst. of Mr. Robinson's report on scavenging in Bolton-upon-Dearne that privy middens are not only insanitary, but expensive to empty and cleanse? Is it not surprising that these insanitary abortions should still be allowed in some of our cities and towns? And now that Mr. Robinson has so clearly shown that they are expensive to the ratepayers as well, is it not to be hoped that the continuation of such monstrosities will not be allowed and that their construction is doomed?

Some Notes on the Uses of Electricity in Municipal Engineering.*

By HORACE BOOT, M.I.E.E., M.I.MECH.E.

The object of these notes, which cover only a general ground of the subject, is to the purpose of promoting a discussion upon the uses of electricity by municipal engineers and surveyors, as during my professional career I have been somewhat struck with the lack of general knowledge shown on several occasions; but when one remembers the multifarious duties that a town surveyor and engineer has to carry out, it is not surprising.

Some of the uses to which electricity can be put to for the service of the public, and which affect the borough surveyor, are :—

Electric tramways.
Street lighting.
Telephone and telegraph poles and wires.
Street fire alarms.
Electric power for all kinds of mechanical work required in municipal engineering, such as—
  Waterworks pumping;
  Sewage pumping;
  Electric lifts in municipal buildings; and
  Electric vehicles for dust carts, fire engines, and other municipal requirements.
Electricity for power purposes in farming, which in rural districts will probably play an important part in the future.
The sterilisation of water, and the production of disinfectants.
The protection of chimneys and high buildings against lightning discharges.

It must be apparent from this list that a borough engineer's and surveyor's knowledge on the above subjects can only be general; at the same time, he is often called upon to advise his council, and probably they expect him to erect works and to carry out any of the above duties in his department.

In the case of a large borough, many of these duties can be undertaken by the electrical engineer; but where a borough employs no electrical engineer, the surveyor would be well advised to consult some expert, just as the town clerk always obtains counsel's opinion on difficult legal questions or problems somewhat outside his sphere.

I have often heard of cases where the borough engineer has been blamed by his council for starting certain works which have been a failure; and in conversation with that engineer I have suggested—[illegible] he had adopted the town clerk's method, and had a expert advice? His reply has usually been that the borough or district would not pay for such advice. If the council are of such a parsimonious character that this is the case, then it is grossly unfair to blame the borough engineer and surveyor for such failures.

TRAMWAYS.

Dealing first with tramways, in large boroughs and cities it is usual to employ a special tramway manager and engineer; but even then the borough engineer should understand a certain amount about tramways, in order that the two of them may work harmoniously together. Tramways in large towns are a public necessity, although it would often be better, instead of carrying them into remote parts of the town, if a motor bus or trackless traction service were started. Capital would be saved and the remote districts would be served just as well. In small towns and in some rural districts tramways are run by companies, in which case a general knowledge of the working of tramways, the damage done to the roads, the extra cost of repairs, all come under the borough surveyor's notice. The question of supplying [illegible] districts or adjoining districts should be tramways, railless traction or motor omnibuses is best left to the decision of the borough surveyor, who would be assisted by the tramway engineer, but it is too much to expect the surveyor to take this additional responsibility upon himself, as if everything goes well, he receives little thanks, whereas if it goes wrong it often costs him his position.

STREET LIGHTING.

In street lighting the surveyor has two classes of illuminant, as a rule, to deal with—electric light and gas—and there is no doubt that, for many purposes, electric light is superior to gas for street lighting. On the other hand, electric light in a town may be too dear and gas may be reasonable, in which case the surveyor would naturally recommend his council to use gas. From the point of illumination, candle-power for candle-power, there is little to choose; but it must be borne in mind that when adopting incandescent gas the candle-power rapidly deteriorates, as well as being unsatisfactory in windy weather. It is also affected by insects, so that there is likely to be a more normal illumination under all weather conditions obtained in streets lighted by electricity. Where, however, the town owns electricity works, and not gasworks, then there should be no hesitation which to adopt. For the lighting of inside premises, electric light is undoubtedly superior and safer, and for that reason nearly all municipal buildings are lighted by electricity.

With regard to heating by electricity, the same does not apply, and, unless the rooms are confined and badly ventilated, gas heating is cheaper than electricity, and more satisfactory for municipal buildings. The lighting of public signs and street names might receive much more attention than it does at present. As far as possible, private interests should not be allowed to render the streets and buildings unsightly by ugly signs, and it was noticeable that just before the war there was a tendency for this class of advertising to increase rapidly.

TELEPHONE AND TELEGRAPH POLES AND WIRES.

With the unsightliness of telephone poles and wires, surveyors have been troubled for years, for the Post Office never seem to consider the beauty of the place, and often place their poles without considering the convenience of anybody. Beyond guiding his council in this respect, the surveyor has, unfortunately, little power; for often, what with the powers possessed by the water company, the electric power company, the Post-Office telegraphs and telephones, it is impossible for him to keep the roads in proper condition, for someone is always taking up the road for one purpose or another. It has often appeared to me that there is a shocking waste of money and want of organisation in this respect. I feel that some power ought to be given to the borough engineer and surveyor to prevent this, and, except in great emergency, to only allow the roads to be disturbed at certain times, and then only after giving proper notice, in order to, as far as possible, open the road for several purposes at the same time.

The question of municipal telephones, unfortunately, seems to have been killed by the Post Office authorities, for if one refers to the Treasury "Minute," dated May 8, 1899, it was then the intention of the Government, on account of the unsatisfactory service given by the National Telephone Company, to permit municipalities to establish their own telephone undertakings, and with the exception of Portsmouth, Hull, Tunbridge Wells, Brighton, Glasgow, Huddersfield, few of the towns seem to have taken these powers seriously. In my opinion this is unfortunate, for telephones are distinctly a local business, inasmuch as it has been proved that 95 per cent of the calls in any town are local, the remaining 5 per cent being trunk calls. Where the municipalities did establish telephone systems, subscribers got lower rates, a better and more efficient service, with the natural result that a much larger percentage of ratepayers became telephone subscribers. It is, unfortunately, too late to [illegible] this question again, for the Post Office see that it would have probably ruined their own telegraph department, and have always looked with a jealous eye upon it, so have made the telephone business a Post Office concern, with the result that the telephones were never more unsatisfactory than they are to-day; that the rates were never higher than they are to-day; that the inattention to the complaints and difficulties were never more apparent than they are now; and, finally, that what might have been a most successful cheap telephone system for every town has been done away with. When the Post Office took over the telephones we were

* Paper read at the [illegible] meeting of the Institution of Municipal Engineers and Surveyors.

The Surveyor
And Municipal and County Engineer.

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promised all kinds of improvements. Experience has shown that it would have been far better to have left the telephone industry with the old National Telephone Company than to have handed it over to a Government Department! It is to be hoped that some future time after the war a Telephone Subscribers' Protection Association will be formed, and that it will do really good work in making the telephone department realise their responsibility to the nation and to their subscribers.

STREET FIRE ALARMS

should be installed in every large town, for they are efficient, not costly, and can be placed under the control of the borough engineer and surveyor.

ELECTRIC POWER

forms such a very big branch of electrical engineering work that I can only mention a few of the uses in which electric power would serve the borough surveyor. One of the advantages of the utilisation of the electric power is that it can be controlled at a distance, which for waterworks and sewage pumping is often invaluable. For waterworks pumping it is admirably adapted, and has been extensively used by several engineers; for sewage pumping it is also admirably adapted, and is more largely used to-day than the average man is aware of.

ELECTRIC VEHICLES.

Electric vehicles are likely to increase, and for such purposes as dust-carts, fire engines, motor lorries for town use, they are hard to beat, either in the expense of running or depreciation. They are coming into much more general use in America, and I am of the opinion they will do the same here when their good qualities are appreciated.

ELECTRICITY FOR USE ON THE FARM.

It may interest you to hear that in America and on the Continent the use of electricity on the farm is making rapid strides. In a farm near Grand Forks, since 1911 electricity has been used for lighting and power purposes. Sixty cows are milked twice a day, the machine for it being driven by electric motors. Motors are also used for threshing, feed grinding, wood sawing, water pumping, and a 35-h.p. portable motor is so arranged that it can be plugged in at many places on the farm to perform various duties.

Another instance, according to the *American Electrical Review*, states that 40,000 acres are cultivated with the electric plough, and that on this farm there are no less than 180 motors and 5,000 lamps connected. In the purely agricultural State of California statistics show that per head of population electric power is used in larger proportions than in any other American State.

In Hereford (England) the city electrical engineer has been encouraging the use of electricity for agricultural purposes with satisfactory results. He finds that the cost of supplying power, in spite of the distances, is not prohibitive. The power works are supplying a farm 3,400 yds. distant from the electricity works, of which 1,200 yds. is by overhead lines, and the cost does not exceed £110 per mile capital outlay, including wire, poles, and labour. On this farm, which is supplied by the Hereford Corporation, milking is done by an electric motor, which drives the vacuum machine; the plant has a capacity for milking eighty-eight cows, and requires about 1½ h.p.

In this district, for agricultural purposes alone, the following horse-power are required:—

Cider making	160 h.p.
Milling	142 h.p.
Farmer's supply	106 h.p.
Water pumping	157 h.p.
Saw milling	130 h.p.

The motors for which are situated on various farms.

As farming is likely once more to become an important industry in this country, everything should be done to promote its success, and the serious increase in the prices of food should convince us as a people that no agricultural land should be left idle, and steps should be taken to put it all under the plough or to some other useful purpose.

STERILISATION OF WATER AND PRODUCTION OF DISINFECTANT.

The sterilisation of water and the production of disinfectants has not been taken up very much, but the medical officer of health for Poplar is a strong believer in it, and has from time to time written a number of papers on the subject, in which he claims that it is cheaper than ordinary disinfectant and more satisfactory.

PROTECTION OF CHIMNEYS, ETC.

The protection of chimneys and high buildings from lightning discharge does not come within the powers of the borough engineer and surveyor, unless he can show that there is danger, and that that danger is apparent. It is quite true that the number of accidents due to this are not many. At the same time these could be prevented if the borough surveyor had the powers to occasionally inspect and see that the lightning conductors on high buildings were in good order. However, far be it from me to add any further duties to the borough surveyor and engineer, for in my municipal experience he is one of the most overworked servants of a corporation.

In conclusion, I must apologise to the members for only dealing in generalities; but to go into detail in any of the above uses of electricity would involve a very long and technical paper, which I have, unfortunately, neither the time to write nor the courage to inflict upon your patience, but I hope some of the topics mentioned will lead to a useful and interesting discussion.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRY HELD.

Edinburgh T.C. (January 8th. Mr. David Ronald).—This was an adjourned inquiry with reference to the proposed town planning scheme for the Duddingston area.—The commissioner heard evidence in support of the case presented in opposition to the scheme by the Mid-Lothian County Council. Mr. P. R. M'Laren, sanitary inspector for the county, stated that there was no foundation for the suggestion that there would be building activity after the war. All the conditions were against it. Mr. W. Ellicott, county road surveyor, stated his opinion that generally the roads in the area were sufficient for the present traffic. The county had not put in operation their compulsory powers of acquiring land for road widening. Mr. A. G. G. Asher, county clerk, said the view of the county council was that the area was not ripe for town planning. Mr. John Ramsay, general manager of the Niddrie and Benhar Coal Company (Limited), said they would be handicapped in their business if the local authority were to dictate to them where they were to put their houses. Counsel then addressed the tribunal.

APPLICATIONS FOR LOANS.

Hereford T.C.—£63,300 for additional electricity plant and mains.

Paul U.D.C.—£1,000 for the Newlyn water supply.

LOANS SANCTIONED.

Willesden U.D.C.—£5,000 for a new feeder electric cable.

Glasgow T.C.—£500,000 for electricity extensions.

SASKATOON PUBLIC SERVICES.

By C. J. YORATH, Assoc.M.Inst.C.E.,
City Commissioner.*

The three utilities owned and operated by the City of Saskatoon, Canada—viz., (a) electric light and power, (b) waterworks, and (c) street tramway—are run upon strict business principles. The council refrain from allowing any local political considerations to militate against their successful operation, and in consequence the citizens are given a cheap and efficient service. The policy of the administration is not to build up large profits, but to place each utility upon a paying basis after allowing for all charges, including sinking fund, interest, and depreciation.

ELECTRIC LIGHT AND POWER.

This utility was established in the year 1908, and has steadily progressed since that date, necessitating the commencement of a new plant in 1911, which was completed in April, 1912. The total output in 1912 was 1,096,147 kw. hours, which increased to 8,456,940 kw. hours in 1915.

The following is a summary of operating costs, fixed charges, and revenue for the years 1913 to 1915:—

	1913	1914	1915
Operating expenses ...	$242,601·59	$205,387·39	$167,418·04
Depreciation, interest and sinking fund ...	74,045·00	96,641·75	99,692·66
	$316,646·59	$302,029·14	$267,110·70
Revenue	347,201·76	340,628·08	275,130·11
Profit	$30,555·17	$38,598·94	$8,019·41

It will be seen from the above that the operating expenses have been reduced from $242,601·59 in 1913 to $167,118·04 in 1915, a reduction of $75,183·55, or 31 per cent.

The smaller revenue in 1915, compared with 1914, was principally due to the reduction in the rates charged consumers for lighting purposes, the old and new rates being 9, 8 and 7 cents, and 8, 7 and 6 cents per kilowatt hour, respectively.

WATERWORKS—SUPPLY AND DISTRIBUTION.

The city is extremely fortunate in obtaining such an excellent and inexhaustible supply of water from the Saskatchewan River, and while in this respect it is better off than its sister cities of Regina and Moosejaw, it is not so fortunate as other cities in the east, which are able to obtain their supply by gravitation. In Saskatoon the water has to be pumped from the river to sedimentation basins, passed through mechanical filters, and then pumped to the distribution mains. In consequence of this, the cost to the consumer is slightly higher than that charged in cities which have a gravitation system.

However, during the past three years the system has been reorganised, and the operating costs reduced to a minimum, with the result that the charge for water supplied to domestic consumers has been reduced from 30 cents to 25 cents per 100 cub. ft., and the meter rent of $2 has been discontinued.

A summary of the operating costs for the years 1913, 1914, and 1915 is as follows:—

	1913	1914	1915
Operating expenses	$97,375·65	$65,295·30	$54,025·31
Depreciation, interest and sinking fund	23,133·66	26,566·36	24,241·45
Total	$120,509·31	$91,861·66	$78,266·76
Revenue	124,623·01	108,601·26	87,517·59
Profit	$4,113·70	$16,739·60	$9,250·83

It will be noted from the above figures that the operating costs have been reduced from $97,375·65 in 1913 to $54,025·31 in 1915, a reduction of $43,350·34, or 44 per cent.

This large reduction in operating costs has been made principally by (a) Stopping leaks and preventing waste; (b) amalgamating the pumping and filtration plants; (c) providing an electrical instead of a steam stand-by for the pumps.

STREET TRAMWAYS.

The street tramway was completed in the latter part of 1912, and commenced operation in the early part of 1913. The total track mileage on a single track basis is 10½ miles, and the average number of cars operating is 14·6. The original fares were six tickets for 25 cents, but these were altered in 1915 to a uniform five-cent fare. The alteration has undoubtedly meant an increase in revenue rather than a decrease in the number of passengers carried.

A summary of the operating costs, fixed charges, and revenue for the years 1913-1915 is as follows:—

	1913	1914	1915
Operating expenses ...	$137,334·11	$126,429·27	$106,938·26
Depreciation, interest and sinking fund ...	40,818·05	51,876·35	50,558·16
Total	$178,152·16	$178,305·62	$157,496·42
Revenue ...	158,487·33	144,996·93	126,522·50
Loss	$19,664·83	$33,477·56	$30,973·92

The operating expenses have been reduced from $137,334·11 in 1913 to $106,938·26 in 1915, a reduction of $30,395·85, or 22 per cent. In spite of the reduction in operating costs, however, the loss has increased from $19,664·83 in 1913 to $30,973·92 in 1915, due to the falling off in revenue during the first six months of the latter year. The revenue during the current year, however, has so greatly increased that the street tramway is now being operated at a profit.

* Extract from Annual Report.

ROAD REINFORCEMENT.

THE ADVANTAGE OF WIRE FABRIC.

In the November issue of the artistic booklet "Road Reinforcement," published by the British Reinforced Concrete Engineering Company, Limited, 1 Dickinson-street, Manchester, and 20 Victoria-street, Westminster, particulars are given of an instructive test under static conditions of a concrete slab reinforced with wire fabric similar to that used in road foundations and concrete roads, showing to what extent a slab of this kind may be bent before breaking takes place. The length of the slab was 18 ft., being 12 ft. between the supports, and having an overhang of 3 ft. at each end; the width was 4 ft., and the thickness of concrete only 4 in. It is not suggested that this is a sufficient thickness for main road traffic, although a reinforced foundation 4 in. thick constructed on the main road carrying London 'bus traffic at Chadwell Heath is acting apparently as well as an adjacent 6-in. foundation similarly reinforced. The test slab is shown in a photograph carrying a load of 21 tons of cement. "This," states the article, "is not an exceptional test for a slab reinforced with wire fabric, and if the test load is removed before breaking, the slab, owing to the high elastic limit of steel wire, recovers the greater part of its sag. A slab similar to that shown in the photograph, but reinforced with plain steel rods in place of wire fabric (and of equal weight) broke with a load of 13 tons. A slab entirely unreinforced, even if 15 in. thick, would, over a similar span, barely carry the same load as the latter. Such is the comparison between concrete reinforced with wire fabric and concrete unreinforced under the test of a static load; but a static load test does not bring out the comparison to the full. It is only under shock loads, such as those of fast-moving traffic, that the tensile strength of the reinforcement has its highest value, and the advantage of the wire fabric is most marked."

THE SURVEYOR'S BONUS.

AN INDIGNANT RURAL COUNCILLOR.

At the last meeting of the Ellesmere, Salop, Rural District Council, the surveyor, Mr. W. H. Owen, made an application for an increase of salary, or a war bonus. He pointed out that he had been surveyor for nearly twenty-two years, and as he had to pay his own expenses, including the keeping of a horse and trap, it was impossible for him to live on his present salary of £140.

The matter was considered in committee, and after a long discussion it was decided by a majority of one to grant Mr. Owen a war bonus of £5 a year until six months after the war.

As Mr. Owen re-entered the room (the *Montgomery County Times* reports), a member, Mr. Darlington, exclaimed: "I don't care who knows; I voted against it. I think it is monstrous!"

As the grant represents an addition of slightly under two shillings a week to the surveyor's salary, we imagine there will be few who will disagree with the worthy councillor in his final remark.

Institution of Municipal Engineers.

EIGHTH ANNUAL MEETING IN LONDON.

The eighth annual meeting of the Institution of Municipal Engineers was held on Saturday last in the Council Chamber, Southampton-row, under the chairmanship of the retiring president, Mr. Henry C. Adams. The attendance included Messrs. A. W. Broker (North Witchford), Geo. Rodley (Norfolk County), G. Simcox (South Mimms), J. Randerson (Sevenoaks), T. C. Barralet (Godstone), H. Pickering (Luton), A. J. Elson (Penge), A. N. Hudswell (Woolwich), T. Mundy (Woolwich), and H. C. H. Shenton (Westminster), together with several visitors.

The PRESIDENT remarked that at the present time the difficulty of travelling was so enormous that they must not be surprised at the smallness of the meeting, though it was to be regretted. He had received from Mr. Matthews Jones, past-president, a letter stating that this would be the first annual meeting he had missed, but that he could not attend, as he was ill in bed. Mr. Finch, senior vice-president, was detained in Cumberland, and Mr. Cutler wrote that he had been ordered to rejoin the Royal Engineers. He was called up early in the year, and after three months' strenuous training, which reduced his bulk considerably, he was sent back to his office; but now they had called him up again. There were a number of letters from other members regretting that they could not attend, owing chiefly to illness and the difficulty of travelling.

ANNUAL REPORT OF COUNCIL.

The PRESIDENT then proceeded to read the annual report, extracts from which are appended.

On June 30, 1915, the roll of the institution was 842, consisting of 672 members, 127 associate members, and 43 students. On June 30, 1916, the roll was 827, consisting of 662 members, 125 associate members, and 40 students. During the year twenty-three members, six associate members, and three students were elected, while two associate members were transferred to membership, and three students transferred to associate membership. The losses resulting from death, resignation, erasure by change of appointment, and other causes amount to thirty-five members, eight associate members, and three students.

FINANCES.

The council are again able to report an excess of income over expenditure on the year's working, amounting to £46 18s. 4d., and making an accumulated balance of £486 5s. 1d. Following the practice of last year, £175 has been laid aside as a provision against "irrecoverables." It will be seen that the "subscriptions overdue" item bulks very largely, but it must be remembered that a large proportion of this is in respect to corporate members and students who are on active service, upon whom no claims for subscriptions have been made, although a certain proportion of them have paid with customary regularity. A proportion of these overdue subscriptions will, doubtless, have to be written off at the termination of the war.

MEETINGS.

One general meeting, eleven council meetings, and six district meetings were held during the financial year.

PREMIUM FOR PAPERS.

The President's premium (presented by Mr. Henry C. Adams) for the year 1915-16 for papers read before meetings of the institution has been awarded to Mr. John H. Mole for his paper, "Some Observations on Municipal Housing."

MUTUAL AID AND DEFENCE FUND.

The amount standing to the credit of this fund at the end of the financial year is £116 3s. 2d. One application was made for assistance from the fund, but the council decided that the case was not one which fell within the purpose for which the fund was created.

COLONIAL AND FOREIGN DISTRICT SECRETARIES.

Having regard to the spread of the membership of the institution to all parts of the world, invitations have been extended to the members in the Colonies and abroad to appoint local hon. district secretaries. As a result of this, hon. district secretaries have already been appointed in Canada, and other appointments are under consideration and will shortly be made. The appointment of gentlemen to these positions will, it is felt, result in increased vigilance in the inspection of applications for corporate membership, while the formation of district committees, where possible, must assist materially in the welfare of members of the institution in over-sea countries.

The PRESIDENT moved that the report and balance-sheet be adopted, and in doing so said perhaps he might refer again to the balance-sheet. It would be seen that, compared with previous ones, it showed a very great improvement in the financial position of the institution. They expected this year that the income would show a very great decrease, or rather that the receipts would be considerably below the expenditure, but economies had been effected in every possible way, and although they had lost a good many members by death on active service, they managed to keep the expenditure within the receipts, and had been able to hand over a sum to the accumulated balance, which now stood at the high figure of £486. During the year they had not gone in for any new development—very naturally. The greatest thing they had done was to formulate and publish the regulations for the Mutual Aid Defence Fund. Many discussions were held over the details, and the institution's solicitor was consulted three or four times at different stages, and assisted in putting the regulations into legal phraseology. The fund, he (the president) thought, should be of great value to the members in the future. He might issue a word of warning, and that was that the war was not yet over. A large number of members were away, and when things sorted themselves out again they would probably have to record greater losses than, unfortunately, they had had to record up to the present. Members on active service had not been asked to pay their subscriptions. They thought that was the least they could do. When that was decided upon they thought the war might be over in a few months, and it had gone into the third year now. The amount lost in this way would loom rather a large item, and while in ordinary peace conditions the members would be asked to pay up the arrears, many would not be in a position to do that. Therefore the council would have to face a certain loss, which would be put down to the war; but, looking at the finances broadly, there was no doubt they would recover their position very shortly after the war.

Mr. SIMCOX seconded the adoption of the report and balance-sheet, and the proposition was agreed to.

Mr. RANDERSON mentioned that one of their members, Lieutenant Fry, had been awarded the Military Cross, a fact which he thought would be interesting to the members.

The PRESIDENT said that information was decidedly of interest, and it would be duly noted in the next issue of the *Journal*.

THANKS TO THE RETIRING COUNCIL.

Mr. G. RODWELL (Norfolk County Council) moved a vote of thanks to the retiring council, which was carried.

Mr. J. RANDERSON (Sevenoaks), in seconding, said that, in spite of the considerable distances which members of the council had to travel, and the difficulties under which everybody had suffered, the attendances at the meetings had been good.

THE NEW COUNCIL.

The PRESIDENT stated that, in accordance with the powers vested in his office, he had appointed Mr. Boot and Mr. Shenton scrutineers of the ballot, and had received their report giving the names of the members elected.

The list of the new council is as follows:—

President: Mr. Edward Whitwell, F.I.S.E., M.S.A., engineer and surveyor, Abersychan Urban District Council.

Vice-presidents: Messrs. A. R. Bleazard, borough engineer, Clitheroe; Arthur Bowes, ASSOC.M.INST.C.E., surveyor, Newton-in-Makerfield Urban District Council; H. J. Farmer, borough surveyor, Christchurch; William Finch, county surveyor and bridge

Chester; Councillor Frank A. Pratley, engineer and surveyor, Epsom Rural District Council; H. C. H. Shadbolt, consulting engineer, 28 Victoria-street, S.W.; and William Wallin, consulting municipal engineer, Newport, Mon.

Honorary Treasurer: Mr. Thos. Mundy, deputy borough engineer, Woolwich.

Ordinary Members: Messrs. John Bailey, surveyor, Spalding Urban District Council; C. Owen Baines, town surveyor and engineer, Paignton Urban District Council; Alfred H. Carrell, county road surveyor, Leicestershire County Council; G. Belson Chilvers, surveyor, Oundle Urban District Council; Frank S. Cutler, deputy borough surveyor, Deptford, S.E.; E. Plummer Davies, engineer and surveyor, Tisbury Rural District Council; John Davison, borough surveyor, Morpeth; Frank E. Ennals, surveyor, Billericay Rural District Council; Douglas C. Fidler, engineer and surveyor, Hayes Urban District Council; W. J. Grant, surveyor, Romford Rural District Council; Arthur Harford-Stevens, engineer, Blaby Rural District Council; Ernest W. Hearn, borough engineer and waterworks engineer, Chard; R. W. Jones, county surveyor, Carmarthen (Western); H. W. Marsden, borough surveyor, Richmond, Yorks; John T. Pegge, city surveyor, Durham; Harold Pickering, surveyor, Luton Rural District Council; John T. Shield, deputy borough and water engineer, Blackburn; G. Simcox, engineer and surveyor, South Mimms Rural District Council; G. Symon, surveyor, Blaydon-on-Tyne Urban District Council; John Taylor, sanitary surveyor, Uckfield Rural District Council; W. T. Unwin, engineer and surveyor, March Urban District Council; Arthur D. Barron, acting borough engineer and surveyor, Douglas, Isle of Man; A. J. Elson, deputy engineer and surveyor, Penge Urban District Council; A. P. Horsley, borough engineer and surveyor, Hartlepool; and G. A. Penwill, surveyor, Peterborough Rural District Council.

The following members hold office as members of council:—

Past-presidents: Messrs. Horace Boot, M.I.MECH.E., M.I.E.E., Westminster; W. H. Matthews Jones, city engineer and surveyor, Chester; and Henry C. Adams, M.INST.C.E., M.I.MECH.E., F.R.SAN.I., consulting municipal engineer, 60 Queen Victoria-street, E.C.

Chairmen of District Committees: Messrs. A. W. Booker, surveyor, North Witchford Rural District Council; Walter Louis Carr, engineer and surveyor, Ruislip-Northwood Urban District Council; William Finch, county surveyor and bridgemaster, Cumberland; Frank Latham, M.INST.C.E.I., borough engineer and surveyor, Penzance; Colin H. Macfarlane, assistant superintendent, Glasgow Corporation; Ernest Albert Stickland, ASSOC.M.INST.C.E., borough surveyor, Windsor; and H. J. Weaver, M.INST.C.E.I., consulting engineer, Gloucester.

RETIRING PRESIDENT'S ADDRESS.

The PRESIDENT then said that the new president, Lieutenant Whitwell, had written to him expressing his great regret that he was detained out of the country by service for the Government, and that he could not get back for the meeting. Lieutenant Whitwell had been abroad for some time, and he hoped he would be in England for the new year. He was extremely disappointed at being absent. It was rather an unusual situation, but everything was unusual nowadays, and the president hoped the members would forgive him. He had asked him (Mr. Adams) to fulfil his duties, and also to read the very able address which he had prepared and sent over to England. He might say that he had received from the clerk to the new president's council a letter stating that the council had passed unanimously a resolution expressing their appreciation of the honour done to Mr. Whitwell and through him to the district, by his proposed election as president of the Institution of Municipal Engineers. He (Mr. Adams) did not think Lieutenant Whitwell would need much introduction to them from him. He had had a very long apprenticeship to municipal work and very early in his career was surveyor to the Prescott Urban District Council, being at that time the youngest man holding a chief municipal appointment. His present post at Aberdare he had held for eight years. Although he had passed out a busy week there he had also found time to write many papers for the technical societies and the chief subject he had dealt with of recent years had been housing, on which he was certainly an authority. He read a paper last year the thoughts which created a great deal of discussion because he showed he could house decent homes with a rent suitable for workmen in prosperous times, if not at the present day. It appeared to him (Mr. Adams) that the working man would oust the middle classes out of their houses, and that the State or municipality would have to initiate housing schemes for the middle classes. As showing the experienced man Mr. Whitwell was, he was also an engineering expert, and had patented more than one recent improvement in internal combustion engines. That was to some extent outside the duties of the municipal engineer, and emphasised the saying that the busiest men have most time to spare. A large number of public buildings stood to his credit, and among them were several swimming baths. He mentioned that because swimming was another art in which Mr. Whitwell had attained prominence. He had won outright the Northern Life-saving Challenge Cup, and also the swimming championship of Bristol City, while he was invited to swim in the International swimming races in 1907. It was said that the engineer was a man of many parts, and they certainly had a man of many parts in Mr. Whitwell. He (Mr. Adams) had every confidence that that gentleman would uphold the importance and carry out the duties of the high office he had been called upon to fulfil in the most able manner.

VOTE OF THANKS TO RETIRING PRESIDENT.

Mr. T. BARRALET (Godstone) said it was his pleasing duty to have to propose somewhat unexpectedly a vote of thanks to the retiring president, Mr. Adams. He had had the pleasure of knowing that gentleman as a member of the institution for a considerable period, and it had been to him a source of instruction and satisfaction to admire the manner in which he had carried out the duties of his exalted office. These duties he had carried out with dignity and impartiality at a period when the difficulties of the office were much more onerous than in the times of peace. Mr. Adams was the distinguished son of a distinguished father—whom also he had the pleasure of knowing in years gone by—and as president he had proved an asset to the institution of no little value. Mr. Adams stood exceedingly high in professional life, and he had been a source of considerable *éclat* to the institution, in whose proceedings he had taken a prominent part. He condoled with him in the difficulties of his position, but the record he had made showed that even in war time the Institution of Municipal Engineers had been able to hold its own. He had followed a worthy line of past-presidents, and if the gentlemen who was to follow him approached even the high character that Mr. Adams had given him in the short *résumé* of his career that had just been delivered, he (Mr. Barralet) ventured to think that Mr. Whitwell would have a somewhat difficult *rôle* in filling the chair in a more excellent manner than the gentleman who had filled it during the past year.

Mr. E. J. ELSON (Penge), in seconding the proposition, observed that, owing to stress of work, he had unfortunately not been able to attend many meetings of the council, therefore he was not elected a member of the council last year, but he might say that he had been a member of the council since its formation, and had had many opportunities of judging the value of Mr. Adams' work. Having been fortunate enough to have been elected a member of the council on the present occasion he had much pleasure in seconding a hearty vote of thanks to the retiring president.

Mr. ADAMS, in reply, said his services had been referred to in far too flattering terms. When he accepted office, much against his will, he said he would do what he could for the institution, and this he had done, but all the same he felt that what he had done was really very little, and certainly far short of what he would like to have done. He attended the meetings he could get to in the vicinity of London, and he also attended a meeting at Newcastle—a very large meeting, where he had the pleasure of meeting fifty or sixty of the Northern members. The members were spread all over the country, but there were large numbers congregated in the North and South. Of course, the member in the South could not very conveniently go up North, while the Northern member found a difficulty in going South, therefore it was very pleasant to have the pleasure of meeting so many gentlemen at Newcastle. The Northern members worked hard for the interests of the institution. They held frequent meetings, and altogether they were a very energetic body of men. Of course, they had all had difficulties to contend with during the present year, and it seemed to him that they were all more or less out in their own little boats on a rolling sea. On the top of the wave they caught a glimpse of a friend, but in the trough of the sea they might not catch sight of him for months. It was quite different to old times,

when they used to know what their friends were doing. His time had been fully occupied during the past year. Early in the year he took charge of the engineering department of a local college to relieve a man on military duties. He had also had charge of an engineering shop engaged in war munitions, the whole of the arrangement of which he had to carry out. Of course, he had also to carry on his own work, and his firm had been selected by the War Office to carry out works for them. He had also had the institution work to attend to, and the only explanation of the fact that he had been able to carry it on was that Mr. Wyand, the secretary, had to a great extent helped him. Everything that had required his attention had been prepared by him in such a form that he could see at once what was wanted, and deal promptly with the matter, and that, as they knew, was a very great assistance to a busy man; whereas hours might have been consumed he found everything cut and dried, and as a consequence they were able to transact business in record time. He had to thank Mr. Wyand for his help, and he knew that the members of the committees also appreciated that gentleman's services. He was afraid that, owing to Mr. Whitwell's absence, they would not get rid of him (Mr. Adams) all at once, but as long as he had the ability he should be pleased to do all he could for the interests of the institution.

The members adjourned for lunch, and on reassembling listened to Mr. Edward Whitwell's presidential address—read in his absence by the chairman. The address is reproduced elsewhere in this issue.

The meeting afterwards proceeded to the consideration of a paper* by Mr. G. Belson Chilvers, entitled

A RÉSUMÉ OF PUBLIC HEALTH MATTERS.

The CHAIRMAN (Mr. Henry C. Adams), in proposing a vote of thanks to the author of the paper, dealt first with the question of open windows. He personally believed in moderation in all things. The closed window was bad, and the ever-open window was likely to be almost as bad. If they wanted to have open windows, they must go into the open country, away from the haunts of man, and from the dust of the roads, because he questioned whether it was healthy to have that dust blown into houses and polluting the air they breathed. It was much more dangerous to have a window open and breathe undiluted fog than it was to have it closed. In the modern room there was a constant interchange of air created by the draught of the chimney, the cracks in the windows and the doors, and unless there was a large number of people present and gas burning one could sit in comparative comfort. With regard to the insanitary arrangements known as middens, in a report of a medical officer of health, recently, statistics were given of infectious diseases classified under the headings of houses provided with water-closets, pail-closets, and middens, and the percentage of cases occurring was much greater with pail-closets than with middens. Of course, the percentage in relation to water-closets was very low. Except in small villages the middens were now very much better than formerly.

Mr. T. C. BARRALET (Godstone) remarked that one could not do too much to emphasise the importance of the health of the people. It was of prime necessity to see that the wastage of war was made good, and to ensure that the coming generation would be physically, mentally, and morally of the best, and, inasmuch as one could not have a sound mind in an unsound body, the foundations of the body must be laid in the homes of the people. The efficacy of an Act of Parliament depended on those who administered it. One might have excellent Acts of Parliament, but out of the hands of persons who had sympathy with their objects they were useless. In rural districts the local councils consisted to a large extent of land owners, property owners, and farmers, who had very little sympathy with the objects of the Public Health Acts; consequently, unless an officer was with a type who was prepared to take the risk of running counter to those who employed him, it would be very difficult to bring the standard of health of a district up to the point it should be. The author of the paper appeared to favour the use of disinfecting powders. On that point he would only say where there were noxious odours use them by all means, but when people spread powders around gullies or put them down water-closets they were on the wrong track altogether. It was a relic of the old times, when it was the practice to burn all sorts of abominations to drive away the plague. Such "remedies" would never do away with the necessity of using the best workmanship in the construction of drainage, and so forth. He thought all of them recognised the advantage of having a bath attached to a house. He used to be a very firm advocate of the provision of baths for workmen's cottages, but after observing the use to which in a number of cases they were put, he had come to the conclusion that such bathing facilities as were provided should be more or less of a public nature. His view was that the extra room was of far more use as cubic space than as a bath-room. He thought they could all sympathise and agree with the recommendation that the time had come when local authorities must more seriously consider their duties as regards the provision of houses for the people. If it was worth while to retain a strong and healthy body of labourers on the soil it was worth while to pay for it. Even supposing the amount they obtained in rents was insufficient to meet the interest on a loan for cottages, it was better to pay a ½d. or 1d. rate on a scheme, because the provision of decent accommodation would in many cases render hospitals more or less unnecessary. The best investment for a local authority after the war—because private enterprise in this connection would be practically wiped out, owing to the cost of labour and materials—would be to see that everybody in their district had a decent, proper, and sanitary home.

Mr. H. PICKERING (Luton) stated with regard to middens that when he went to his district first he found that the closets were chiefly of that type, but since then he had persuaded the owners of property to render them impervious and more sanitary. In the 1909 Act, powers were lacking to make tenants of houses have proper regard for cleanliness, and he hoped that in any new Act that was passed that point would be dealt with.

Mr. REGINALD BROWN (Southall-Norwood) contended, as regarded housing, that the whole thing rested upon the proper education of the people. Better housing accommodation was impossible unless they educated the people to use the houses provided for them in the way they should be. His view was that there should not be more than ten houses to the acre in working-class schemes. As regarded baths, he warned them that they would not get anything through the Local Government Board unless they provided baths—either in the sculleries of the smaller houses or in separate rooms in the larger dwellings. It had often occurred to him that the extra cost was the chief thing which prevented a good many people providing this absolute necessity, but he thought some simple, inexpensive arrangement might be devised to get over the difficulty. Housing in rural districts was a much more troublesome matter than in the urban districts. The housing of the rural population throughout Great Britain—and Scotland in particular—was a national scandal. The amount of disease in these districts was appalling, and it would be a revelation to many to know how much of this arose from bad housing accommodation. Either they must give a man a sufficient wage to enable him to pay a reasonable rent, or they would be compelled to bring into force some form of State assistance to help the local authorities who were responsible for the public health. In regard to the disposal of refuse in rural areas, it was for engineers to devise some simple means by which this material could be got rid of in an easy manner. As an example of what could be done in this direction, they had before them the work of the military authorities; it was absolutely surprising what perfect methods of dealing with slop water and excreta could be introduced into rural areas at little or no cost, and to all interested in the provision of these inexpensive systems of disposal of refuse he would recommend a visit to the exhibition at the Duke of York's School at Chelsea, arranged by the London Sanitary Companies.

The vote of thanks was passed.

Mr. CHILVERS, senr., in replying on behalf of his son, said there was, of course, a great deal in what had been said as to open windows and dust. At the same time, unless windows were kept open the air in rooms—particularly small rooms—could not be kept pure. He, personally, did not quite agree with the writer of the paper in regard to the codification of the Public Health Acts; he thought, however, it would be a good thing to have these Acts consolidated into two or three Acts dealing with water, sewerage, and sewage disposal, and so on.

The next paper,* contributed by Mr. George Redfern, was entitled

PRACTICAL ROAD WORK.

Mr. G. SIMCOX (South Mimms), in proposing a vote of thanks to the author, inquired how the spraying

* See page 45.

* See page 43.

the roads was done, and whether there was any advantage in allowing the tar to boil all day in the sun before gritting. Mr. Rodley favoured gravel for gritting, but it seemed to him that sharp sand was the most serviceable material, and particularly on hilly portions of roads. In such situations it was his practice to leave it along the sides of the roads with a notice inviting carmen to sprinkle it themselves. The result was that the council's workmen were not required to do the work.

Mr. J. RANDERSON (Sevenoaks), dealing with the author's advocacy of the use of 2-in. stone, pointed out that in these days material of that size could not always be obtained. His experience was that they could more easily get a smaller material. He had recently used much of this smaller material, which he had found, after tar-painting, made an excellent road. He did not, personally, see the necessity for keeping a road closed for tar-painting. Was there any better wear in Mr. Rodley's case?

Mr. H. PICKERING (Luton), referring to dry rolling, remarked that the practice was to do too little of this in many rural districts, and to put on the stone too early. Generally it was the first six months that determined the life of a road. In many rural districts surveyors had to deal with roads with poor surfaces, over which passed fast and often heavy traffic, and they were expected to keep down the expense. The cost of putting in good foundations was prohibitive. It was his own practice to put down a layer of 3-in. stone, which he found most effective, on soft roads it made a good foundation and a fairly good surface. Two or three years afterwards it was coated, and he obtained a good road. The practice in regard to road drainage varied in different parts of the country. In the far North it was always the practice for the roadmen to clear out the ditches at the sides of the highways. He had found that was often left to the farmers and others, but he thought it would pay the highway authority to take the work in hand and do it effectively. It paid to keep the water off the roads.

Mr. REGINALD BROWN (Southall-Norwood) mentioned, in regard to the subject of footpath flagging, that the usual crossfall for artificial stone in the South of England was ¼ in.

Mr. T. MUNDY (Woolwich) stated that he had frequently laid artificial stone with a crossfall of ½ in. with quite satisfactory results. With natural York stone he had used a crossfall of ¼ in. That, also, was satisfactory, so that he did not think it was always advisable to have too great a crossfall, but just sufficient to throw the water into the road channel. In any case, it did not make for comfort. As regarded the bedding of flags, he had a preference for solid bedding, which made a far better job. It was preferable, of course, in gritting operations, to use a machine, but the material one used must not be of too loamy a nature, otherwise the machine was apt to clog.

Mr. RODLEY, replying, said his view was that the tarpainting of roads in outside districts and county roads away from villages should be done by machine. In towns the work should be done in half-widths, but in the case of single-track roads they had no alternative but to deal with the whole width in one operation. For gritting he used gravel at 3s. 6d. a load—good, clean gravel. He found no difficulty at all in obtaining 2-in. granite. His experience had taught him that when he wanted 2½-in. Leicestershire stone he must order 2-in., but that when ordering from overseas he must order what he wanted. Gritting in large towns should be done by machine. With regard to the cleaning of ditches and watercourses, in his district they made a practice of issuing to farmers notices requiring these to be cleaned out where necessary.

The third and last paper* was contributed by Mr. Horace Boot, and dealt with the

USES OF ELECTRICITY IN MUNICIPAL ENGINEERING.

THE CHAIRMAN (Mr. Henry C. Adams), in moving a vote of thanks to Mr. Boot, observed that the object of the paper was to draw attention to the importance of a knowledge of electricity among municipal engineers. He found himself, after serving his articles, that such a knowledge was essential to an engineer, and it was an absolute necessity in these days. Mr. Boot had given a fairly comprehensive list of things to which electricity might be applied. One was sewage pumping. In small schemes the cost of labour had always been a great trouble, but he had got over

* See page 26

the difficulty in recent works with which he had been concerned by adopting automatic electric pumping machinery. He knew it was tried a good many years ago and proved a failure, but the apparatus that was obtainable to-day was infinitely superior to that sold ten or twelve years ago. In the matter of electric tramways, the permanent way came under the borough surveyor, but the electrical equipment was, of course, a specialised part of the work that he would advise no one to dabble in unless they were expert electrical engineers. There was no doubt that the installation of electric generating stations by municipal authorities and the distribution of electricity for power purposes would be of very great benefit in many districts, and would, with proper management, prove remunerative undertakings.

Mr. H. C. H. SHENTON (Westminster), seconding, said he had been impressed for some time past with the importance of making use of electrical machinery for sewage pumping. He could say from experience that sewage could be pumped very satisfactorily in either large or small quantities by centrifugal pumps run by a motor. It seemed to him that the fact that a very small pump would lift sewage quite as efficiently as a large one was not properly grasped. It was extraordinary when it was possible to use a small automatic electric pump that ejectors, with the necessary air compressing stations, and so forth, should be put down.

Mr. REGINALD BROWN (Southall-Norwood) said Mr. Boot was to be commended on a highly instructive paper. The subject was one which must come to the front, especially in those places where there was an electricity undertaking. He agreed as to sewage pumping. He could not understand why it should be necessary to construct large storage tank accommodation and then put in immense centrifugal pumps to lift the sewage to another part of the works for treatment, instead of lifting the sewage up gradually throughout the day. Electric vehicles for municipal work had a very great future, but it remained yet to be seen whether the petrol was better than the electric machine. But he thought the electric vehicle had shown itself to be a very useful machine indeed. He saw no reference in the paper to the treatment of sewage by electricity. That might be considered by some to have been an absolute failure, and it had been in a great many cases, but it did not follow that methods would not be brought into use by which the system would be a success, both in the point of cost and efficiency. He believed himself that it was possible to use electricity for this particular purpose.

The vote of thanks was passed, and the proceedings then terminated.

Flash-lamps Without Batteries.—A practicable flash-lamp without a battery—either primary or secondary—sounds almost too good to be true, yet, according to *L'Industrie Electrique*, the feat has been accomplished in Germany by utilising a tiny magneto-generator driven by a spring and clockwork. The mechanism is provided with an escapement which ensures constant speed of revolution for the generator armature, and hence constant voltage. Nothing (the *Electrical Review* observes in noting this interesting innovation) is said about the initial cost of the apparatus, which must be much greater than that of the battery lamp; but by manufacturing in great quantities it should be possible to bring it down to reasonable limits.

Standardising Scottish Municipal Wages.—Representatives of the burghs of Airdrie, Coatbridge, Hamilton, Motherwell, and Wishaw have met in conference for the purpose of considering the wages paid and hours of duty, and in the outdoor departments of the respective town councils with the view of securing greater uniformity in dealing with applications for increase of wages or bonus. Generally (says the *Glasgow Herald*), the conference resolved that the hours of labour, the remuneration per week, the overtime and Sunday pay, the holidays per annum, and the sick pay be standardised. In the matter of increase of wages, the conference recommend a uniform wage in the streets and cleansing departments, the figures being equal to the highest at present being paid in any of the burghs. Provision was made for a Standing Committee being appointed, to whom would be submitted applications for increases of wages, and who would decide whether any question so affected the common interests of the burghs as to call for a joint conference being held.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Barnsley T.C.—The borough surveyor, Mr. J. H. Taylor, in his annual report, states that only seven dwelling-houses were erected in the town last year, and that fewer cottages were erected than in any of the preceding twenty-five years. He estimates that to make up for the decreased number of cottages 500 to 600 ought to be provided.

Exeter T.C.—Plans of a temporary smallpox hospital which the borough surveyor, Mr. T. Moulding, has prepared, have been referred back to the Sanitary Committee to provide a smaller scheme. Mr. Moulding's plans provided for a six-bed block, an administrative block, laundry, mortuary, disinfector, drainage, fencing, road making, and water supply, at an estimated cost of £3,729.

Manchester T.C. — The Parks Committee have formally sanctioned a scheme for erecting workshops for the benefit of the convalescent soldiers in Heaton Park. The materials have already been obtained by the military authorities, and the work of erection will be proceeded with immediately by the soldiers themselves on a suitable site in the Hall camp. The intention is to teach the soldiers various trades during the period of convalescence.

HOUSING AND TOWN PLANNING.

Aberdare U.D.C.—Consideration is being given to a housing scheme, to take effect after the war.

Chesterfield T.C.—The medical officer of health, Dr. R. Fraser, having reported that at least 200 houses should be erected by the corporation, the Housing Committee have been authorised to go into the matter.

Gelligaer U.D.C.—It is proposed after the war to build working-class houses at Gilfach, Bargoed.

Glasgow T.C.—The medical officer of health, the master of works, the sanitary inspector, and the manager of the city improvements department have received instructions to send to the town clerk, Sir John Lindsay, all the reports, plans, and other information in their possession referring to the question of housing and general town improvement, with a view to a synopsis of the reports being prepared for the Special Committee on Housing and General Town Improvement.

Nuneaton T.C.—The Local Government Board have asked the council to submit to them their proposals with respect to the housing scheme, with a view to obtaining sanction to a loan as soon as circumstances permit.

West Hartlepool T.C. — The Local Government Board have, under the Housing and Town Planning Act, sanctioned the corporation's control over 3,778 acres in various parts of the borough. The original application referred to 5,332 acres.

MOTOR TRANSPORT.

Cheltenham T.C.—It has been agreed to purchase an electric vehicle for £1,050 for the collection of house refuse. It was stated that, at a charge of 9d. per mile for electricity, the new vehicle would effect a saving of £10 per annum on the present charges.

Glasgow T.C.—The superintendent of cleansing reports that the first of the two Edison electric vehicles for refuse collection was delivered on December 4th, and is giving entire satisfaction.

ROADS AND MATERIALS.

Chapel-en-le-Frith R.D.C.—The council have made arrangements to release the surveyor of highways, Mr. E. J. Hunter, for road service in France, and have agreed to pay him the difference between his salary and his Army pay. Mr. J. Lomas, road foreman, has been appointed Mr. Hunter's deputy during his absence.

Colchester T.C.—Provision is to be made in the next estimate for the use of tarred clinker on certain roads.

Derbyshire C.C.—A proposal of the county surveyor to establish a central depot and tar-macadam mixing plant, at an estimated cost of £7,000, was before the council on Wednesday. Authority was given for the scheme to be proceeded with.

Dublin T.C.—Schemes for the widening of Chancery-street and Lower Liffey-street have been prepared for submission to the city council.

Ellesmere Port U.D.C.—The surveyor, Mr. J. M. Hudson, has been instructed to prepare a specification of the work required to complete the North-road.

Keynsham R.D.C.—An intimation has been received from the Somerset County Council of their intention to take over the whole of the main road tarring and deal with it direct from the county surveyor's office by the county contractors, the work to be paid for direct by the county council. The surveyor, Mr. J. Johnson, said the work of tarring would be extended, and he believed it would tend towards economy in road maintenance. The rural council would have some control as to how much was done, as they could make recommendations to the county council.

Penrith R.D.C.—The Highways Committee reported that they had considered a letter from the county council with reference to the Emergency Provisions Act as to prohibiting the use of certain roads by motor omnibuses, &c. It was decided that the county council be informed that this council does not desire to prohibit the use of any district roads under the Act, which is only a temporary measure. Mr. Bolton asked what was the object of closing roads to omnibus traffic? The clerk said he supposed it was really meant for localities where there was an enormous traffic for Government purposes.

Perthshire C.C.—The Western District Committee have decided again to approach the Glasgow Corporation on the subject of the Trossachs road. Their proposal is that the corporation should construct a light railway alongside the road, and that the district committee should bottom the road—which has an average width of 11 ft.—and make it suitable for motor traffic.

Sheffield T.C.—The city surveyor, Mr. W. J. Hadfield, has been authorised to negotiate with the Midland Railway Company for the construction of islands or refuges for the better protection of foot traffic at the station approach.

SEWERAGE AND SEWAGE DISPOSAL.

Newport (Mon.) T.C.—The Mannesmann Tube Company have written to the corporation stating that about 300 men would shortly be employed at their Newport works, in addition to 120 by the United Tube Corporation, and suggesting that the sanitary arrangements be complied with. The Health Committee recommend that a deputation should wait on the company to urge that the construction of the proposed sewer, at a cost of £36,000, should be deferred for the time being, and that a temporary arrangement should be made to deal with the sewage.

Wantage R.D.C.—The Local Government Board have written, with reference to the council's application for a loan to carry out a drainage scheme at Letcombe Regis, that the parish was in greater need of a water supply, and suggesting that the sewerage scheme should be deferred until a water supply had been provided.

WATER, GAS, AND ELECTRICITY.

Burton U.D.C.—The council have accepted the tender of Messrs. R. & J. Dempster, Manchester, for the installation of a benzol plant at the gasworks. The tender of Messrs. Tangyes, for pumps, and the tender of the Cradley Boiler Company, for two oil storage tanks, are also recommended for acceptance.

Derby T.C.—The Electricity Committee propose to effect main extensions at an estimated cost of £250.—The council have approved the recommendation of the Electricity Committee for the extension of the generating station including the installation of new machinery.

Eastbourne T.C.—Owing to official lighting restrictions, a deficiency of £2,100 in the municipal elec

[illegible] account for the past half-year is reported. There is however a substantial reserve, accumulated [illegible]

Kirkcaldy T.C.—With reference to a report of the [illegible] with respect to the present [illegible] and the applications for additional [illegible] Mr. Small, who was consulted in the [illegible] to the town's council, states that it would not be [illegible] to abandon the present generating [illegible] on account of the greater expenditure [illegible] a new station would entail. He considers the only [illegible] to a bulk supply is the re-[illegible] of the existing station, and he submits a programme of extensions spread over ten years, which he thinks would meet the requirements in Kirkcaldy for at least that period. He states that Mr. Balfour, the managing director of the Fife Power Company, would be prepared to recommend his company to acquire the existing undertaking at the amount of the present capital indebtedness, which is approximately £38,000, his company to supply all current power in bulk for the present and future requirements of the corporation, the corporation paying a certain sum per annum towards the expenditure, and to retain control of the distribution of electricity within the burgh. Failing the adoption of that suggestion, he thinks the next best alternative would be to extend the present works, at an expenditure of £61,300, spread over a period of ten years.

Manchester T.C.—The Electricity Committee recommend the city council to apply to the Local Government Board for borrowing powers to the extent of £30,000. The last sanction for a similar amount, the committee state, is fully earmarked for sub-stations now being equipped, and before any further necessary contracts can be placed it is imperative that further powers should be obtained.

Newport (Mon.) T.C.—The Waterworks Committee have inspected a site in the Caerfanell Valley, near Talybont, with a view of constructing a reservoir there. The landowners are to be asked for permission to make trial holes at certain given points.

Plymouth T.C.—The Water Committee have given a sub-committee full authority to make arrangements with the proper Government department for the employment of German prisoners of war on the construction of the new pipe line.

Port Glasgow T.C.—The council have presented a Provisional Order to the House of Commons for the purpose of augmenting the existing water supply. It is proposed to raise the embankment of Auchendores reservoir 6 ft. and to divert the waters of Cunston Burn into this reservoir, giving an increased supply equal to six weeks for the whole community.

Walsall T.C.—It was stated in the report of the Electricity Committee that, owing to the Ministry of Munitions having commandeered certain plant at the [illegible] works, it had been decided temporarily to increase the charges for current by 20 per cent in order partially to meet the prospective deficit on the undertaking.

MISCELLANEOUS.

Halifax T.C.—The nett profit of the tramway undertaking last year was £9,965 as against £16,211 in the previous year.

Sheffield T.C.—The city surveyor, Mr. W. J. Hadfield, reporting on the state of his staff as affected by military service, states that since July, 1914, the number of surveyors has been reduced from 1,150 to 416. He recently appeared before the local tribunal in respect of two clerks and twenty-four workmen. The men were given one month's further exemption, [illegible] three months' exemption and eight [illegible] exemption. Three others had already obtained conditional exemption, and these together with fifty-one already enrolled were the whole of the staff of military age. The average age of those now employed is about 40½ years. A suggestion had been made that women might be employed and more [illegible] for [illegible] work. The shortage however, was among the skilled labourers. There are [illegible] positions open for sweeping and other light work. If there could be a scarcity in this [illegible] it would be advisable to introduce female labour. It was reported to the Highway Committee that in view of the [illegible] of the work now being carried out the [illegible] would not be raised at the present time to provide the [illegible] for road work in France.

PERSONAL.

Mr. F. Dowling has been appointed temporary surveyor to the Clare Urban District Council.

Mr. James Donnelly has been appointed surveyor to the Enniskillen Urban District Council.

Mr. H. Vickery, surveyor to the Totnes Rural District Council, has been appointed surveyor to the Malling (Kent) Rural District Council.

Mr. J. R. Wright, of Redcar, has been appointed assistant surveyor to the Blackwell Rural District Council for the duration of the war, at a salary of £130 a year.

Mr. H. A. Endsor, formerly district surveyor at Keynsham, has been appointed surveyor of the Long Ashton main roads by the Somerset County Council, at a salary of £200 a year and £30 travelling expenses.

Mr. H. C. E. Rayner, borough surveyor of South Molton, has joined the Forces, and the town council have decided to pay him the difference between his Army pay and separation allowance and the amount he received as salary.

Mr. G. Plummer, surveyor to the Hayward's Heath Urban District Council, has been voted £40 in respect of extra work done by him in the preparation of surveys, plans, specifications and supervision of the private street works in Western-road.

Mr. Leslie Roseveare, M.INST.C.E., borough engineer of South Shields, has taken up duty as Corps Road Officer, with the rank of Captain in the Royal Engineers, in the recently formed battalions for service in France.

Mr. W. Davey, surveyor to the Brandon Rural District Council, has joined the Army for road work in France, and the council have agreed to employ Mrs. Davey to keep the books in his absence, allowing her £28 per annum for this work. Mr. Froud will carry out Mr. Davey's professional work.

Mr. S. W. A. Carter, city surveyor of Gloucester, has accepted service with the Road Corps in France, with rank of Captain in the Royal Engineers, and Mr. R. Read, consulting engineer to the city council (the former city surveyor), has been appointed temporarily city surveyor and waterworks engineer, with an extra allowance at the rate of £100 a year, with the necessary clerical assistance.

Mr. F. J. Hurley, surveyor and sanitary inspector to the Crickhowell Rural District Council, has been appointed deputy road surveyor to the Breconshire County Council, in the place of Mr. W. L. Harpur, who has accepted a commission as Captain in the Royal Engineers for road service in France. Mr. Wilfred Watkins, Llangynida, has been appointed deputy surveyor to the Crickhowell Rural District Council.

Mr. George Rodley, district surveyor to the Norfolk County Council, who was one of the readers of papers at last Saturday's annual meeting of the Institution of Municipal Engineers, commenced his career in the Sheffield highways and sewerage department. At the age of twenty-five he was general foreman to the Ripley, Derbyshire, Urban District Council, and three years afterwards took up a similar position under the corporation of Leamington. Later he became district, and subsequently chief, foreman under the borough engineer of Birkenhead. His next position was that of clerk of works on Road Board improvement works, under the West Suffolk County Council. He was appointed to his present post in June, 1914. It may be mentioned that his father has for about twenty-five years filled the position of highways superintendent under the Sheffield Corporation.

MILITARY CROSS.

Lieutenant Wallis Coales, R.E., son of Mr. Herbert G. Coales, engineer and surveyor to the Market Harborough Urban District Council, has been awarded the Military Cross.

Government Grant for Dublin Rebuilding.—The Dublin Castle authorities have received £100,000 as an instalment of the Government's ex-gratia grant for the rebuilding of house property destroyed in Dublin during the rebellion. In the absence of information as to the amount of compensation, building work has not yet been commenced in the principal thoroughfares. Two or three houses have been rebuilt in the side streets, but while the number of wooden shops in the main streets is being constantly increased there is no sign of the erection of any permanent structure.

A Résumé of Public Health Matters.*

By G. BELSON CHILVERS, Engineer and Surveyor, Oundle Urban District Council.

Health is probably the greatest and the most sought-for thing in our lives. I feel that the healthy nation is the most progressive. Without health nations and men must deteriorate. Happiness and comfort are bound up in it, and therefore if we desire to progress and live comfortably and happily we must continually seek after it and do our part in all respects to secure it for ourselves and others.

We often hear it said that cleanliness is next to godliness, and I would in all sincerity say it is akin in many cases. Godliness goes with cleanliness. Insanitary and unhealthy conditions assist the devil and all his works, and many people leave the squalor of their homes to seek what they call pleasure and enjoyment in the haunts of vice and sin. Social reforms in health and sanitation, I believe, assist to make people better morally and spiritually, although these reforms cannot of themselves give the true spirit and make a devil a saint. Insanitary and unhealthy conditions impair long life, lower vitality, and render people living in them prone to many of the diseases and ailments of mankind.

Doctors' medicine and faith may go a long way in curing us of ill-health, but we need to remember the old saying, "God helps those that help themselves," and the securing of healthy conditions is one of the foremost helps we can render. It is surprising how ignorant or how negligent many people are of the ordinary laws governing hygiene. Soap and water, freedom from dust and dirt are rarely sought after, and would appear to be at a great premium.

In my inspection of various houses I have seen many cases where people seem to glory in their dirt, from the living-room to the bedroom. Fresh air and sunlight only accidentally gain access to their dwellings. It is very certain that none need live in filth or be dirty in their person.

Dust, dirt and filth are the breeding-places for flies, fleas, microbes, disease germs, &c. Insects are disease spreaders; they travel from filth to food and deposit infectious matter thereon.

Ventilation, with a boundless supply of fresh air and sunlight, are wonderful cures for many dread diseases, purifying and cleansing the air we breathe; yet we find windows closed and blinds drawn to shut out the pure air and sunlight. The sun must not shed its rays upon our furniture, carpets, &c., for fear of making them fade! We had far better only have things which do not fade than shut out the glorious sun's rays. What is the use of by-laws compelling builders to provide windows of at least one-tenth the floor area, half of which must be made to open, if we defeat the object for which they were made?

Many people, too, have an unnecessary amount of hangings and draperies, ornaments, knick-knacks, and other dust harbourers about their houses; rooms have too many ornamental mouldings, crooks, crannies, and corners about them; and all these harbour dirt and dust, and time will not allow them to be cleaned except on quite rare occasions, which may be annually at the time called "spring cleaning." Carpets may be very well in their way, and make a room more cosy, but it is certain they are not so cleanly as linoleum or stained and polished floors, with a few rugs or mats placed where required, and easily taken up and freed from dust.

Wallpapers often leave much to be desired, more especially when a new paper is put directly over an old one. I have found as many as six papers, each on top of the other—a most insanitary arrangement, as decomposition must take place. Why can we not get ourselves used to distempered or painted walls? They can be made to look very nice by a proper arrangement of colours and forming dado and frieze, and are certainly more sanitary and healthy.

We are all agreed that dust, dirt, garbage, and other rubbish should be kept as far as possible from the dwelling-house, yet it is surprising how often we find the rubbish receptacle as close as possible to the doors and windows of the house. It is to be regretted that in so many towns these receptacles are open wood boxes, pails or old baths. We find a grand selection, but it is a difficult matter to secure the provision of a proper bin, and the official even does not obtain the support he should. If only we could press upon people the necessity to secure for themselves a proper galvanised bin with cover, which appears to me to be the most satisfactory if properly used! We have recently had brought to our notice a contrivance which, although ingenious, leaves, I think, much to be desired. We have all been to the open rubbish box, and know that it harbours flies, and gives off a most unpleasant odour; this would not be experienced with a proper bin. What is the use of having fly papers and catchers in the house if we surround ourselves with breeding-grounds?

The drainage and sanitary arrangements to our houses need constant attention, and should be periodically cleansed and flushed. A liberal use of disinfecting powder or fluid may be allowed, but it is always better to give our attention firstly to the cause of offensive emanations, and then we may find that no disinfecting agent is needed. Especial care needs to be taken in connection with those antiquated and most insanitary arrangements called middens, although these are gradually disappearing, and the sooner they are abolished the better.

In the majority of towns there are now efficient drainage and sewerage systems, and proper means of disposal. There are yet still towns without an efficient system. Many large country villages also have no system, and the conditions are most unsatisfactory. These places do not bother about it; they seem content to go on in their own "sweet way." They will not hear of any scheme. Those responsible look upon themselves as economists; yet their economy is but false, and their interest a "pocket one," the welfare and well-being of the people being the last consideration. A pure and efficient water supply is another essential for all places, yet we have many small towns and villages without it. Water is taken from defective and impure sources, while wells are close to cesspools and drainage from cattle yards, and other fouled surfaces have access to them. This is often due to the faulty construction of the well or cesspool. What appears to have happened is this—two holes were dug, and lined with dry-laid bricks, one being called the well and the other the cesspool. Can we wonder at disease being rampant? We also find the water supply taken from an open pond, full of mud and growth, and often a drain pipe discharging its contents into it. Many small towns and villages view with great disfavour and are up in arms if an efficient system of sewerage, sewage disposal, or water supply is suggested. They will tell you that their arrangements have sufficed for the past and no ill results have occurred; the inhabitants, they say, live as long as they like, and yet facts prove otherwise. A case like this occurred during the past few weeks in the district adjoining mine. In places where proper systems have been installed the death-rate is lowered, infantile mortality reduced, infectious disease eradicated, or nearly so, and the general health bettered.

Slum dwellings and houses packed together in any corner, without sufficient air space round about them, are another factor conducive to ill-health, although such arrangements are now practically impossible, and those in existence will undoubtedly be done away with before many years.

It is to be regretted that so many of the smaller houses have no proper facility or cupboard for the storing of food. A dry and well ventilated pantry should be a *sine qua non* if food is to be kept in a wholesome condition.

A bath and bath-room should also be provided; even in the case of very small property, why could not a small building be erected for the use of about six houses? What upon this matter. I should like to ask why some water authorities, who are also the sanitary authority, make an extra charge for water used for a bath? It is what I call taxing cleanliness, and should not be.

It is also necessary that the places where people are employed should be well ventilated, lighted and clean, and that only a limited number of persons should work in a certain space.

The Governments of the past and present have been alive to the importance of these matters, and have pass-

* Paper read at the annual meeting of the Institution of Municipal Engineers last Saturday.

us. Two Acts and have compelled, and are compelling sanitary authorities to carry out works, and to raise loans for the works, to make the country healthier to live in and to prevent the spread of disease.

The most important Act is the Public Health Act of 1875 amended in 1890 and 1907, which deals with matters of sewerage, sewage disposal, drainage and sanitation, water supply, street and house scavenging, nuisances, offensive trades, infectious diseases, food inspection, construction of new buildings, slaughter-houses, common lodging-houses, and like matters. We have also other Acts relating to the milk supply, embodying regulations as to lighting, ventilation, and cleanliness of cowsheds, dairies and milk-shops, also as to infectious disease among animals, canal boats, caravan dwellings, factories and workshops. We have also other Acts amending and extending these Acts, and new ones entirely dealing with important health matters, and I believe that since 1875 over sixty Acts have been passed dealing with matters allied to this subject. The Local Government Board have great power bestowed upon them to wake up defaulting authorities to their responsibilities, compelling them to carry out works.

The most important Act of recent years is without doubt the Housing and Town Planning Act of 1909, which makes it compulsory for all sanitary authorities to cause to be made from time to time a systematic inspection of all dwelling-houses in their district and to tabulate the conditions found as to sanitation, general repair, lighting and ventilation of the premises, and as to the number of inhabitants of each house. Owners may be compelled to remedy any defects, and in cases of general dilapidation to close the house for human habitation, and if necessary to demolish the premises.

This is a most important Act, and will undoubtedly improve the housing conditions of the poorer people. The Local Government Board are stringently enforcing its carrying out, and require annually a full report as to work done. It is to be regretted that owners of property should so often need forcing to do necessary work. Local authorities have also power bestowed upon them to erect in their district houses for the working classes, and the Local Government Board can compel authorities to carry out schemes where there is a scarcity of houses.

Another important matter which can be carried out under this Act is the preparation of town planning schemes, showing how the district is to be laid out in the future, the line or course of any new streets, the laying out of estates, sites for open spaces, recreation grounds, public buildings, &c., and the number of houses that may be erected on a certain area.

I feel that it would be a good thing if all districts, especially those urban in character, large and small, prepared a scheme. In many towns we find *cul-de-sac*, necessitating the taking of circuitous routes, or the travelling over ground twice when once would suffice. These streets are likely to remain as such, owing to the action of the owner of the land adjoining.

I mentioned previously the number of Acts there are in force dealing with public health and kindred matters. It is said that these were all embodied in one Act of Parliament. The present crisis is not an opportune time to go into the matter, although I feel that as much consideration should be given to it and municipal engineers and sanitary surveyors given a chance to air their views. Amendments and additions are needed still: there are many anomalies, and some sections are certainly not clear. Possibly a commission might be appointed, composed of men, chiefly surveyors, medical officers and others, who would receive evidence. Probably we shall in the future have a Ministry of Public Health, or some other department, whose duty it will be to deal with this subject.

We each have our individual responsibilities in this great matter, and can make our towns or our country villages better to live in from a health point of view. Let us pray that God will bless us for our foresight and consideration, and we shall become a healthier, stronger and longer lived nation.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

TOWN-PLANNING INSTITUTE.

A NEW TOWN PLAN FOR THE CITY OF DUBLIN.

Mr. J. W. Cockrill, M.INST.C.E., presided on Friday last at a meeting of the Town Planning Institute, held at the rooms of the Institution of Municipal and County Engineers, 92 Victoria-street, S.W., when papers were submitted by Prof. P. Abercrombie, A.R.I.B.A., and Mr. S. A. Kelly, F.S.I., on the town plan for Dublin, prepared by the authors which was awarded the prize offered by the Marquis of Aberdeen to the municipality of Dublin.

Prof. Abercrombie said the plan was based upon three main factors—sociological, geographical, and historical. Other considerations entered naturally into the course of its elaboration, but these three were the determining factors which shaped its physical conformation. The sociological basis took the form of an imperative requirement—the need for some scheme upon which to provide new houses for 60,000 persons who were living in sub-human conditions. The two other factors related to transportation. The geological factor was the conformation of the valley of the Liffey, by which it was evident that a tunnel could be made without excessive cost along the valley to connect Amiens Station with Kingsbridge Station, and a cross connection could be devised to connect Westland Row Station with Amiens Station, or with the east and west tunnel, and join Kingstown with Kerry and the North. The geological factor, then, suggested the feasibility of complete railway unification and a central Union Station.

The historical factor referred to the road system, particularly on the north bank, where the traffic aims of the country roads, making for the one bridge across the Liffey to the walled mediæval town on the south, were sufficiently apparent. A restoration of this natural web provided an objective, at present thwarted, for the radial roads, with a crossing, not by the original bridge, as the block of the Four Courts intervened, but immediately to the east, duplicating Richmond Bridge. On the site of the old Ormond Market, then, was the new traffic centre of the city, the road and railway centre coinciding, as they should wherever this was possible. The south bank was less simple to treat, but by the creation of a subsidiary road centre the difficulty had been overcome, and by this arrangement Sackville-street was freed of the incubus of the tram nexus.

The silting up of a large part of Dublin Bay had suggested (*a*) the method upon which dock extension should proceed; (*b*) two areas for reclamation, the northern industrial and the southern residential; and (*c*) the utilisation of the North Bull bank, already naturally reclaimed, for a great sea-fronting park. At the mouth of the harbour a colossal power station was proposed.

Dublin presented a most attractive ground for the town planner to work upon—its possession of a series of public buildings of great nobility, whose setting was frequently marred by the juxtaposition of deepest squalor or brutal utilitarianism; its famous Sackville-street, now about to be rebuilt; its fine series of radial roads; its individual wide streets, tenement ridden and isolated from full city life; its north and south circular roads; Phœnix Park, whose wedge-shape the most meticulous landscape architect could not improve; and the Liffey, a stream capable of the most beautiful treatment. These and many other fine features were waiting to be worked into a consistent and coherent plan.

Prof. Abercrombie proceeded to point out how some of the very misfortunes of Dublin in the past now gave it opportunities in the way of town planning denied to other towns. There was a dense population in the centre, but in opening up outside areas there was not a vast accretion of by-law suburbs to face. There were also a great number of derelict sites about the centre area, which presented an unrivalled opportunity for central improvements. The proposals by his partners and himself had been plotted in three periods, according to their degree of urgency, and modifications could be introduced as the work proceeded, without destroying the general conception. It also illustrated how the main objects of the plan could be put into operation at an early stage, so that the commercial improvement might ensue, while their final completion would come about naturally as prosperity rose high. If the method of a periodic development was clearly grasped there was no need to be daunted by the magnitude of the proposals. Enormous results could be obtained if

only everything that was done, however small, was part of a thought-out organic scheme.

A paper had also been prepared by Mr. Sydney A. Kelly, who collaborated with Prof. Abercrombie in preparing the scheme. The paper dealt more in detail with the proposals of the authors, and these were explained by Prof. Abercrombie with the aid of a fine series of lantern slides.

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ

(One man does not see everything.)
—EURIPIDES.

SURVEYORS AND COTTAGE DESIGN.

To the Editor of THE SURVEYOR.

SIR,—In the lecture by Prof. S. D. Adshead, which is reported in your issue of Friday last, there appears what is, to my mind, a most unjust attack and slander upon the general body of surveyors to local authorities.

The worthy Professor says in plain terms that we should not be trusted with, and are incapable of, preparing plans of houses under town planning schemes. If this is so, then heaven help us; at any rate, if some of the houses one has seen at various garden cities are to be taken as models, it will be difficult to realise what we are aiming at.

Among many of the above models we may particularly note the following: Pantry or larder stuck under the stairs, or perhaps in some corner, and about 4 ft. square; then, more often than not, the water-closet, or pan privy, immediately adjacent to larder, and separated therefrom by a 4½-in. wall. Then comes the living-room or kitchen, still in the happy company of the above water-closet or pan—and the same 4½-in. wall. Then there is usually a kitchen or living-room of about 10 ft. by 9 ft., containing about six doors, sink, washing copper, &c.—all this to make a family comfortable.

On one occasion I had the privilege of preparing a housing scheme of about fifty cottages, and I took the plans to an eminent architect at the head of a certain Government Department. All went well until I was asked: "What provision do you suggest for the removal of the smell from cooking of meals?—the smells of this should not pervade the bedrooms." I suggested that the smell of cooking would be very welcome in many artisans' homes. But it was insisted that something must be done, and the arrangement accepted was that the usual trap or door giving access to the roof should be of perforated zinc, and an additional flue provided in the upper part of the chimneys, with entrance to same, by an air-brick, the said flue, air-brick and perforated zinc together being intended to carry off the fragrant breakfast fumes. The scheme then went through, the houses were built, but no flue, no zinc. No; we like to smell the cooking.

When will architects and housing companies produce a sound, comfortable cottage for the working classes? Villadom can look after itself; it is cheap, good cottages that are wanted, not decorated summer shelters at 10s. or 12s. per week.—Yours, &c.,

LOCAL SURVEYOR.

January 9, 1917.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

MAIN ROAD DISTRICT SURVEYOR.—January 13th.—Derbyshire County Council. £230 per annum.—Mr. J. W. Horton, county surveyor, County Offices, Derby.

TEMPORARY BOROUGH SURVEYOR.—January 13th.—Corporation of Middleton.—Mr. J. P. Walmsley, town clerk, Town Hall, Middleton, Lancs.

SURVEYOR AND INSPECTOR.—January 15th.—Dorking Urban District Council. £250 per annum.—Mr. W. J. Hodges, clerk, 64 South-street, Dorking.

TEMPORARY SURVEYOR'S ASSISTANT.—January 23rd.—Corporation of Aylesbury.—Mr. W. Harold Taylor, borough engineer and surveyor, Town Hall, Aylesbury.

TEMPORARY ASSISTANT.—Tenby Town Council. 30s. per week.—Mr. B. Morley, borough surveyor, Tenby.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

EAST LANCING.—January 16th.—For the erection of a timber barrier and a timber wave screen on the sea front, for the commissioners.—Mr. Kenneth Loader, deputy clerk, Town Hall, Southwick, Sussex.

Engineering: Iron and Steel.

JOHANNESBURG.—February 15th.—For the supply of machinery for extension of by-products plants at the municipal abattoir, for the town council.—The Town Clerk, Municipal Offices, Johannesburg.

MERTHYR.—January 17th.—For supplying and laying 760 yds. of 12-in. and 9-in. stoneware pipes, for the Merthyr and Aberdare Joint Farms Management Committee.—Mr. W. B. Harris, clerk, Town Hall, Merthyr.

AUCKLAND (New Zealand).—January 21st.—For the supply of mild-steel or iron gates and fencing, for the Harbour Board.—Messrs. W. & A. McArthur, Canberra House, 18-19 Silk-street, Cripplegate, London, E.C.

HALIFAX.—January 22nd.—For the supply of an efficient 65 per cent crude benzol recovery plant at the gasworks, for the corporation.—Mr. Percy Saunders, town clerk, Town Hall, Halifax.

Mechanically Propelled Vehicles.

LONDON.—January 24th.—For the supply of one 5-ton steam tractor and four 6-ton trailers, for the Metropolitan Asylums Board.—The Clerk, Asylums Board Offices, Thames Embankment, London, E.C.

Roads.

WOODBRIDGE.—January 15th.—For the supply of granite or basalt broken to pass through a 2½-in. gauge, and to be rejected by a 1½-in. gauge, whole chalk flints, washmill flint, pit flint, Kentish rag, and any other road material, for the rural district council.—Mr. G. Cook, district surveyor, Ipswich-road, Woodbridge.

REIGATE.—January 17th.—For tar-washing about 137,000 yds. super. of roads, for the corporation.—Mr. Fred. T. Clayton, borough surveyor, Municipal Buildings, Reigate.

BERKS.—January 19th.—For day work, carting of macadam and other materials, for the county council.—Mr. A. Langston Yockney, acting county surveyor, Shire Hall, Reading.

SOMERSET.—January 20th.—For steam rolling and scarifying, for the county council.—Mr. Gordon R. Folland, acting county surveyor, Wells, Somerset.

SOMERSET.—January 20th.—For the supply of broken granite or basalt, for the county council.—Mr. Gordon R. Folland, acting county surveyor, Wells, Somerset.

WORCESTERSHIRE.—January 20th.—For the supply of granite, blast-furnace slag, and tar-macadam, for the county council.—Mr. C. F. Gettings, county surveyor, 30 Foregate-street, Worcester.

ESSEX.—January 20th.—For the supply of team labour, stoneware pipes, Norwegian granite kerb and setts, York kerb, and distilled tar, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

ESSEX.—January 20th.—For tar-spraying on main roads, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

NORFOLK.—January 20th.—For the supply of flints, gravel, chalk, team labour, tools, barrows, and hand-carts, for the county council.—Mr. W. W. Gladwell, county surveyor, Shire House, Norwich.

MIDHURST.—January 21st.—For the supply of broken granite, for the rural district council.—Mr. A. G. Gibbs, surveyor, Council Offices, Midhurst, Sussex.

SLEAFORD.—January 22nd.—For carting granite and slag, for the rural district council.—Mr. Ernest H. Godson, clerk, 27 Northgate, Sleaford.

SURBITON.—January 22nd.—For the supply and delivery of refined or distilled tar, for the urban district council.—The Surveyor, Council Offices, Ewell-road, Surbiton.

DORSET.—January 24th.—For the supply of granite, basalt, limestone, and tar-macadam, for the county council.—Mr. E. H. Habgood, acting county surveyor, County Offices, Dorchester.

STRATFORD-ON-AVON.—January 27th.—For the supply of 2-in. and [illegible] slag, 2-in. and ½-in. dry slag, 2-in. and ½-in. granite, and 2-in., ½-in., and ¼-in. limestone, for the corporation.—Mr. F. W. Jones, borough surveyor, Town Hall.

SOUTH STONEHAM.—January 29th.—For the supply of British granite, to be delivered at various railway stations, for the rural district council.—Mr. F. Hendley, district surveyor, Chevan Side, Old Portswood Southampton.

NESTON.—January 31st.—For the supply of broken stone chippings and metal macadam, for the urban district council.—The surveyor, Town Hall, Neston, Cheshire.

HERTS.—February 1st.—For the supply of refined tar, to comply with the terms of the Road Board Specification, No. 1), for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

HERTS.—February 10th.—For surface tarring approximately 1,250,000 sq. yds. of main roads with refined tar, for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

Sanitary.

WILLESDEN.—January 15th.—For the removal of refuse, for the urban district council.—Mr. S. W. Ball, clerk, Municipal Offices, Dyne-road, Kilburn, N.W.

CHELMSFORD.—January 16th.—For the construction of a surface-water drain and other drainage works, for the corporation.—Mr. P. T. Harrison, borough engineer, Municipal Offices, Chelmsford.

HAMBLEDON.—January 16th.—For scavenging the district, for the rural district council.—Mr. F. Smallpiece, clerk, 138 High-street, Guildford.

MANCHESTER.—January 19th.—For the execution of general contractors' and plumbers' work in connection with drainage, for the sanitary department.—The Superintendent, Sanitary Department, Civic Buildings, Mount-street, Manchester.

NORTHWICH.—January 22nd.—For the collection and removal of refuse, for the urban district council.—Mr. J. A. Cooke, clerk, Council House, Northwich.

Stores.

PLYMOUTH.—January 15th.—For the supply of paints, varnishes, ironwork, petroleum oil, broomheads, household brushes, rope, iron and steel, pitch-pine, deals, flooring, carbolic powder, Portland cement, lubricating oils, tar and pitch, painter's brushes, explosives, soap, wood blocks, creosote, disinfectant fluid, granite kerbs, setts, white lead, red lead, linseed oil, turpentine and turpentine substitute, refilling machine revolving brooms, benzoline and motor spirit, tools, indiarubber goods, hose, and ship chandler's goods, for the corporation.—Mr. James Paton, borough engineer and surveyor, Municipal Offices, Plymouth.

OXLEY.—January 31st.—For the supply of setts, granite macadam, pitch and tar, slag dust, tar-macadam, limestone macadam, and brushes, for the urban district council.—Mr. O. Holmes, surveyor.

BATTERSEA.—January 24th.—For the supply of veterinary attendance, horse hire, materials for cart and van repairs, ironmongery, leather, harness material and fittings, paints, special paints, enamels, painters' sundries, varnish, lime, cement, granite macadam and chippings, [illegible] York paving, Thames ballast and sand, stoneware pipes, timber for carpenters and joiners' work, timber for wheelwrights' work, [illegible] roofing slates, iron castings, coal entrance covers, iron bars for blacksmiths' work, repairs to baths and street refuge and manure from the council's stables, disinfectants, coal and coke, and [illegible] for the borough council.—Mr. W. Harris, Wilcox, town clerk, Town Hall, Battersea, London, S.W.

MIDDLESBROUGH.—February 1st.—For the supply of annealed scoriæ (broken), bricks, castings, concrete flags, [illegible] Portland cement, pitch and tar, sanitary pipes, gullies, junctions, slag (broken), coal (dry [illegible]), [illegible] timber, whinstone and granite (broken), whinstone and granite setts and kerbs, brushes, bolts and nuts, disinfectants, electric lamps, general stores, glass, hardware, india rubber [illegible] steel, [illegible] oiling sets, paints and [illegible], [illegible] glass shields and shafts.

Press, Limited 24 [illegible] and copies, for the Case has done a valu[illegible] town clerk, Mumbles.—*Southport Guar*

Miscellaneous.

BANBRIDGE.—February 3rd.—For the public lighting of the urban district with gas or electricity, for the urban district council.—The Surveyor, Municipal Offices, Banbridge.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

25. Concrete Institute: Mr. C. R. Peers on "The Care of Ancient Monuments."

APPOINTMENTS OPEN.

BOROUGH OF AYLESBURY.

Applications are invited for the appointment of Temporary Surveyor's Assistant, subject to a month's notice on either side.

Applicants must be ineligible for military service, a good Draughtsman and Surveyor, and should have had experience in a Municipal Engineer's Office.

Applications, stating age, experience, salary required, and when able to commence duties, accompanied by copies of three recent testimonials, to be delivered at my Office not later than Tuesday, January 23rd, 1917.

WM. HAROLD TAYLOR,
Borough Engineer and Surveyor.

Town Hall, Aylesbury.
January 5, 1917. (3,225)

TENDERS WANTED.

RUISLIP-NORTHWOOD URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the following Supplies, delivered at Northolt Junction (G.W. and G.C. Joint Station), or Ruislip Metropolitan Station, respectively, and for the Haulage thereof:—

(*a*) 1,500 tons Tarred Slag Macadam and Slag Dust in proper proportions, at per ton each size.
100 tons Hand-picked Brick or good Concrete Hardcore, 4½-in. gauge, at per ton.
1,200 tons Coarse Gravel, 2-in. gauge, at per ton.
Clean Clinker, not less than 2-in. gauge, at per ton.
Certain delivery must be guaranteed.

(*b*) The necessary Team Labour or Haulage by Tractor of the above Materials from either Stations, at per ton for the 1st mile and 2nd miles respectively.

Tenders, sealed and endorsed "Tenders for Tarred Slag Macadam," or "Tenders for Haulage," must be delivered to the undersigned not later than 10 a.m. on January 22nd, 1917.

Separate Tenders for the Supplies or Haulage will be considered.

The Council do not bind themselves to accept the lowest or any Tender.

EDMUND R. ABBOTT,
Clerk to the Council.

Council Offices,
Northwood, Middlesex. (3,236)

COUNTY COUNCIL OF MIDDLESEX.

TO QUARRY OWNERS, GRANITE MERCHANTS AND OTHERS.

Tenders are invited for the Supply of about 7,500 tons (more or less) of 2-in. and 1½-in. Hand-broken Basalt for road construction, and 500 tons (more or less) of ¾-in. Clean Chippings, to be delivered from the various Stations in Middlesex.

Particulars, with Specification and Form of Tender, may be obtained at my Offices after Monday, the 15th instant.

Tenders must be sent to the Clerk of the County Council, Middlesex Guildhall, Westminster, S.W., by 12 o'clock (noon) on Wednesday, the 7th February, 1917.

The lowest or any Tender will not necessarily be accepted.

H. T. WAKELAM,
County Engineer.

County Engineer's Office,
Middlesex Guildhall,
Westminster, S.W.
January 9, 1917. (3,237)

The Surveyor

And Municipal and County Engineer.

Vol. LI. JANUARY 19, 1917. No. 1,305.

Minutes of Proceedings.

Water Filtration.

For various reasons the term water filtration is very often taken as including a number of other processes, such as storage, settlement, coagulation, aëration and sterilisation. Hence, when a paper is written upon the filtration of water it will often be found that the greater part of the description refers to preparatory treatment and after treatment. The cases in which filtration alone will economically purify a water up to a proper standard are either those in which the water is of a peculiar quality or those in which the system of filters is very elaborate. The popular idea that the mechanical filter is a self-contained device, whereby any raw water may be immediately purified without further treatment, ought to be removed, and it would be well if those who write papers could make this matter clearer in the title.

Elsewhere in these pages we give an account of a paper entitled "Experiences in Water Filtration," read before the Canadian Society of Civil Engineers by Mr. H. G. Hunter. The paper deals with the subject fully, giving an account of preparatory treatment, and coagulation, the construction, working and washing of filters, and also of sterilisation. As resident engineer in Montreal for the New York Continental Jewel Filtration Company, Mr. Hunter's remarks have a special application. It is to be noted that, with regard to the cleaning of the filters and to the use of strainers at the bottom of the filters, the author is not altogether in agreement with the opinions of other American engineers. He refers to the use of air to agitate the sand for washing, and to revolving rakes as being the ordinary method, but it should be remembered that in later practice the washing water is very often forced up through the gravel and sand at such a rate that the sand is floated, thereby agitating and cleansing in one operation. Neither does the author mention the fact that a properly graded layer of gravel will act as a distributor of rising wash water, rendering screens and strainers unnecessary. This leads to simplification and cheapness in the pipe underdrainage system. One may refer to the papers of Messrs. Ellms, Fuertes, Spurr Weston, Hoover, Sperry, Lovejoy, Burgess, and Siddons, and notably to a paper written by Messrs. Ellms and Gettrust, all of which have been dealt with in these pages. These papers clearly show that the opinion of the American engineers is in a great measure against the cleaning devices described by the author, and it is to be regretted that he did not deal with this opinion. On the other hand, the paper is full of valuable detail and advice such as we are accustomed to get from the other side of the Atlantic, and such as we do not receive from engineers in this country, who, although they have very large filtration plants under their control, do not seem ready for an interchange of opinions and experiences such as would without doubt throw new light on the subject and be extremely useful.

It is only natural that the author should be in favour of the use of chlorine gas for sterilisation, having regard to the new plant at Montreal for making this gas in enormous quantities. It should be remembered that there is a great difference of opinion on this point, and that Dr. Houston has in a recent report described experiments made with chlorine gas and with chloride of lime, and reported in favour of the use of chloride of lime for the sterilisation of the London water. The claims made for the quick action of chlorine gas were not supported by the tests made by Dr. Houston.

* * *

Rural Repopulation.

In view of the exceptional importance which attaches at the present time to every phase of the problem of national reorganisation after the war, a paper on "The Repopulation of Our Rural Districts," which was read by Mr. Theodore Chambers at the last meeting of the Surveyors' Institution, is of special interest. While it is true that, broadly speaking, the subject is one which does not directly affect municipal engineers as such, yet, as Mr. Chambers was able to show, they must be concerned in it to some extent, inasmuch as it involves a consideration of the problems of overcrowding and rural housing. Indeed, if the object be to get more people on to the land, to increase our home-grown food supply, and to remedy the evils of crowding into cities, then it will be necessary so to improve the conditions of rural life as not only to retain the present rural population, but also to attract people from the towns. Mr. Chambers' main idea was not directed to an increase in the number of people in rural areas who are directly engaged in agricultural pursuits—important as this end is in itself—but rather to securing what he described as a bold policy of industrial penetration of the country. In other words, he desires to break down the present artificial division of the population into two camps, town and country, with completely different and often hostile economic conceptions. The fact is that we have never quite got away from the tradition of the time when cities were clearly and definitely bounded by walls and fortifications. In those days the distinction between town and country was an essential one

The town stood for commerce and industry, and the country for agriculture, and agriculture only. Now, however, we have a large rural population not directly engaged in agricultural pursuits, a population which would be increased to the benefit of both town and country if the "industrial penetration" advocated by Mr. Chambers were to take place on any considerable scale. His thesis is that society has it in its power, if it chooses to exert itself in certain directions, to modify the present conditions, and to produce other conditions which will cause men other than agricultural workers to remain in the rural districts for preference, and even attract people away from the towns into the country. In this connection the question of improved transport facilities becomes of great importance. If factories are established in the vicinity of railways in country districts, it at once becomes possible to avoid the burden of high rents and high rates and the hindrances to rapid expansion which exist in the congested conditions of the city, where, indeed, expansion of any kind is often a matter of impossibility.

We observe with pleasure that towards the end of his paper Mr. Chambers had a good word to say for the dignity of municipal work and the status of municipal officials. Town management in the future, he says, should be one of the great professions, requiring a training in economics, civil welfare, town planning, and social work of every description. The position of town manager (or civic engineer) should be coveted by men of high attainments and great skill. By this means the whole tone of local self-government would be raised. With this, of course, we cordially agree. Once the public importance of the work is recognised, as it ought to have been years ago, we may perhaps hope to see that improvement in the conditions of the municipal service, as regards pay, status and security of tenure, which we have been consistently advocating for many years past.

* * *

Industrial Research.

At the last meeting of the Junior Institution of Engineers the subject of industrial research, which is so much to the fore just now, was under discussion, being introduced by a very able paper by Mr. A. P. M. Fleming, of Manchester. The national importance of industrial research may be stated as a syllogism. Industrial progress depends on the acquisition and use of new knowledge; research is the acquisition and application of new knowledge; therefore industrial progress depends on research. Mr. Fleming showed that properly organised research is of benefit not only to the manufacturer, but also to the manual worker, the financier, the educationist, and the community generally. The worker is bound to feel any increased prosperity in his industry caused by the introduction of new and improved methods, while to the financier research is of importance in that it provides him with new fields for the profitable employment of capital. The educational advantages of research are so obvious that they hardly need emphasis, and the community as a whole must ultimately benefit by the discovery of new secrets of Nature and their application to industrial purposes. In considering the question of research, it is not without interest to reflect that some of the researches most important to industry, and especially to engineering projects, have been carried on in contemporary sciences, as, for instance, the case of the prevention of malaria and the construction of the Panama Canal, the developments in aviation dependent upon the petrol motor, &c. In other directions the research efforts that have been made to cure, for example, tuberculosis, will, if successful, have marked effect in conserving the man-power, and therefore the productive capacity of the community, while physiological researches concerning fatigue and efficiency of workers may have far-reaching results.

As compared with America, industrial research in this country is still in a condition which can only be described as embryonic. Much progress has been made in the laboratories of universities by individual scientists who have devoted their attention largely to pure science investigations. In many cases individual firms have secured the assistance of the university laboratories in carrying out researches to meet their particular requirements. In the future, however, it will be more and more necessary for the firms of each industry to consider what processes, tools, and methods are common to all of them, and to co-operate in producing the greatest possible improvement in connection therewith for the benefit of all. It seems probable that the plans provided by the Government during the past two years for the assistance of industrial research, now merged into the undertaking known as the Imperial Trust for the Encouragement of Scientific and Industrial Research, will be directed to co-operation with industrial groups rather than with individual firms. In process of time, however, it is to be hoped that research work may be merged into one institution, which would centralise research for all industries. Such an institution would have the additional advantage of serving as the centre for the collection and distribution of information from all sources that could be turned to account in industry.

* * *

The Burgh of Buckie and their Contractors.

An important case with respect to the right of contractors to remove their plant was decided recently in an appeal heard in the Court of Session at Edinburgh. The plaintiffs were the Corporation of Buckie, and the appellants, Messrs. Charles Brand & Son, of Glasgow, were contractors for works of harbour extension, now approaching completion. They had removed some of their plant, and had intimated their intention to remove such additional plant as was no longer required for the remaining work to be done. The terms and conditions of the contract provided that all vessels, plant, and material provided by the contractors should become the absolute property of the town council, and should not be removed from the site without the written sanction of the engineer, whose firm had been appointed by the corporation. Application was made to him for his sanction to the removal of certain plant, and he informed the town council of the application, which he was of opinion ought to be granted. The town council informed the engineer that he was their servant in this matter, and instructed him to withhold his consent. In pursuance of these instructions the engineer replied to the defendants that he was unable to grant permission. At a later stage, however, and again on the instructions of the town council, he told the defendants that they were at liberty to remove certain wagons provided the price was deposited with the town council as security, in addition to £4,000 of retention money already held by them. The contention of the defendants on appeal was that the town council's change of front came too late, and that they were not bound to accept the decision of the engineer on the ground that he was disqualified by having already decided the question in dispute against them. They argued further that the town council in controlling the engineer had broken their contract, and had no title to rely upon the absence of information which they caused him to withhold. The Divisional Court virtually upheld the view of the sheriff-substitute that, as the town council had renounced the posi-

tion that they were entitled to control the engineer, and since the latter had merely acted on a wrong view of his legal position, there was no reason for the contractors thinking he was biassed against them, nor why he should not proceed to consider an application for the removal of the plant. The whole trouble, the Court declared, had been caused by the wrongful attitude taken up by the town council, who were found liable in costs. The decision is chiefly instructive as determining the legal position of the engineer and the illegality of the position of the burgh council in interfering with him in the exercise of his discretion. They had obviously dropped into the common error that, as they had appointed him, they were therefore entitled to control him in their own interests.

* * *

Right to Inspect Documents.

Is a member of a local authority entitled as of right to see all books and documents in the custody of the council and relating to official business? This interesting question was asked—and answered—in the course of certain High Court proceedings on Monday last, when an alderman and ex-mayor of a Metropolitan borough sought a mandamus to compel the production to him of certain documents, inspection of which had been refused by the town clerk acting on the instructions of the Public Health Committee. It appears from the arguments that were addressed to the Court that both parties agreed that, in the absence of special circumstances, the alderman would have been entitled to the inspection which he desired. It was alleged, however, that in asking to see the documents in question he was not actuated solely by motives connected directly with the proper discharge of his duties as a member of the council, but that he had, consciously or unconsciously, another indirect motive. The documents had reference to a closing order which had been made by the council in 1911 under the Housing, Town Planning, &c., Act, 1909, and which had been the subject of appeals to the Local Government Board and litigation ever since. It appears that the alderman had come to the conclusion that the closing order ought now to be determined, as in his opinion, formed after seeing the house to which it referred, the house was now fit for habitation. He thereupon gave evidence for the owner at a Local Government Board inquiry, and also in the course of a Chancery action that had been commenced by the owner against the council. Of course, as the Court made perfectly clear, he was acting quite within his rights in doing so, but they held that he had so identified himself with the owner that in the circumstances his common law right to see documents ought not to be enforced by the discretionary writ of mandamus.

* * *

A Record Salary.

The limit in small salaries appears to have been reached by the Narberth, Carmarthenshire, Urban District Council, whose surveyor tendered his resignation at the last meeting, one of the grounds being that "the salary (sic) he received for doing all the work pertaining to the office of surveyor amounted to only 4d. a day, and there was a good bit of work to be done." What would happen, we are tempted to ask, if he were called up for military service? Would the council expect him to pay them the difference between his military pay and his civil remuneration, as other authorities make up such differences to their officers absent on service? We can almost believe that they would. At all events, his plea for an increase, on the ground that the price of all necessaries had risen abnormally, was met by one member with the remark that everything had gone up for the ratepayers too. Another reason put forward for the resignation was that, as the council did not advance the necessary money with which to pay wages, the surveyor had to run all over the town to borrow it. It may be that the council expected him to advance the wages out of his "salary," but unless other wages were on equally princely lines this was clearly impossible. As a result of discussion, some account of which will be found in another column, it was resolved to ask the surveyor to continue in office and to let the question of salary remain in abeyance until after the war. He asked to be allowed a month in which to consider this suggestion, and this request was granted.

* * *

A Famous Well.

At the recent monthly meeting of the Holywell (North Wales) Urban District Council the members had before them a laconic report by the surveyor in the following terms: "I very much regret to report that on Friday last St. Winefride's Well ran dry." The reference was, of course, to the famous curative spring, supposed to be of miraculous origin, and the town of Holywell owes its prosperity in no small measure to the numbers of pilgrims who resorted annually to the "Holy well." The alleged cause of the failure is, in the circumstances, a little prosaic, as it is supposed to be due to the boring operations of the Halkin Drainage Company and the Holywell Halkin Tunnel Company. Be this as it may, there can be no doubt as to the serious results to the town of the stoppage of the flow of water, and the council no doubt acted wisely in appointing a committee to take the necessary steps to ascertain the legal position. Our contemporary the *Manchester Guardian* suggests that, with a little imagination, the failure of the spring might even be laid directly to the war's evil account—inasmuch as the custodian of the well was recently given a month to prepare himself for entrance into the Army, and a well with a miraculous origin might not inconceivably have its own method of registering disapproval of interference with its affairs by a military representative. If this be so, it may be that, as one member of the council suggested, the water may return as suddenly as it has disappeared.

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Fence Walls on Main Roads.

On many occasions the West Riding County Council have received requests from highway authorities in the Riding to build or repair fence walls adjoining main roads, but have hitherto refused to undertake any responsibility in respect thereof unless their liability could be established. In the official gazette for January of the County Councils Association it is stated that the question has now been reconsidered, and inquiries made from several county councils show that the practice varies. The council have come to the conclusion that they ought to take into consideration certain cases where the absence of a fence is likely to be a source of danger to the public, and therefore are prepared to consider the question of paying for, or contributing to, the maintenance or building of fence walls in such cases, and where it cannot be ascertained that local authorities or private owners are responsible.

"THE SURVEYOR" SPECIAL ISSUE.

The Special Annual Issue of "The Surveyor" will be published on Friday next, and readers who propose to accede to our request for a short statement, for inclusion in the number, of the works projected by their authorities for 1917, will greatly oblige by making their return not later than Monday next.

Specifications for Highway Bridges.

[The following proposed specifications for highway bridges, prepared by a committee of the Canadian Society of Civil Engineers, were discussed at a recent meeting of the Mechanical Section of that body. Copies of the proposed specifications have been sent to the various branches of the society for their observations and when these have been received the committee will make their final recommendations to the annual meeting.]

These specifications are intended to apply to steel highway bridges carrying ordinary highway traffic with or without electric street cars. They will not, however, cover bridges which carry electric railways only, as these will be designed under the specification for steel railway bridges.

In the case of combination bridges, carrying both railway and highway traffic, the responsible engineers on each individual project will be expected to issue particular specifications governing the questions of loading and unit stresses. Further, insomuch that modern practice has adopted riveted structures for all ordinary highway work, the specifications will not cover pin bridges, so that in the instance of long and important structures, where eye-bars and pin connections might possibly be used to advantage, special clauses covering this class of work will need to be drawn up by the responsible engineer.

The range of service to be accommodated under the general head of highway traffic is, necessarily, extremely wide, but the following are the principal considerations which will enter fundamentally into the design of those structures covered by this specification —

(1) The amount of money available for the construction and its effect on the question of the permanency or semi-permanency of the bridge and upon the question of providing for probable future increase in traffic.

(2) The location of the bridge and the character of the roads in its neighbourhood with the probability of their being subject to improvement

(3) The situation with respect to traffic as affecting the character of the flooring and the nature and magnitude of the superimposed loads.

With a view to meeting the whole range of conditions the specification classifies bridges according to the requirements of service and permanency under the following heads:—

Class 1 is intended to provide for first-class permanent structures situated on main arteries of traffic in large towns and cities where heavy concentrated loads, due to transportation of machinery and building material frequently occur. Bridges as designed under this class will be equal in respect to permanency, rigidity, thickness of metal, and all details, to those built under the best railway practice.

Class 2 is intended to provide for city bridges in residential districts, where general traffic regulations limit both the loads carried on the highway and the speed of street car traffic. Bridges designed under this class will be equal to those designed under Class 1 in respect of general stiffness and constructional details.

Class 3 is intended to provide for highway bridges in towns where heavy manufacturing is not conducted and for bridges on main country highways. The need of providing for actual or possible street car traffic and the issuing of specifications regarding the street car loads are matters which will be left to the responsible engineer.

Class 4 is intended to govern roadway bridges serving farming communities and situated on unpaved roads where it is unlikely that the character of the loading will change during the normal life of the structure.

Class 5 is intended to provide for bridges in remote or mountainous districts difficult of access, where lightness and first cost are prime considerations in determining the character of the proposed bridge.

The purpose of the classification is not rigidly to force every bridge under a specific head, but to guide the responsible engineer or purchasing authority in the making of suitable decisions regarding loads, unit stresses and general design. In consequence whereof the clauses touching upon these essential questions will refer to the various classes suggested. The engineer on important bridges will still be expected to use his professional judgment and his knowledge of local conditions, either of which may justifiably lead him to a combination or modification of the classes here outlined or of the clauses in the specification referring thereto.

MOVABLE BRIDGES.

The specifications cover the design of the structural work for all kinds of movable spans, and include clauses governing the design of the machinery and machined parts of hand-operated swing bridges. In the case of power-operated swing spans, bascule or vertical lift bridges, where the machinery is an all-important feature of the construction, it is recommended that the design of these features be referred to an engineer specialising in this work.

FLOORS.

For bridges built under Classes 1 and 2 a careful description of the floor system to be employed should be supplied by the responsible engineer, preferably by drawing or detail sketch. Special care should be taken to indicate the proposed method of carrying street car tracks.

A "permanent" floor shall be understood to signify a floor where the base consists of either—

(*a*) Reinforced concrete slabs.

(*b*) Concrete or brick jack arches.

(*c*) Buckle or trough plates carrying the concrete matte.

A floor where the base is wood, whether creosoted or not, will not be considered permanent.

Under Class 1 a permanent type of floor is everywhere demanded, and the pavement or upper course shall be of granite setts, brick, asphalt, macadam, or treated wood blocks, as determined by the engineer.

Under Classes 2 and 3 the character of the floor will be specified directly by the responsible engineer, but it is stipulated that the stringers shall be of steel, and the structure shall be designed to carry at the specified unit stresses a floor consisting of a reinforced concrete base with a pavement of 4-in. wood blocks, or any other heavier type which may subsequently be laid.

Under Class 4 a wooden floor is permitted, but the adoption of steel stringers is recommended.

Under Class 5 the lightest type of wooden floor is allowed, but even here an inquiry into the probable ultimate economy of longer panels with steel stringers is suggested.

SIDEWALKS.

Under Class 1 sidewalks shall also be permanent, and shall have a cement finish to the slab or a special wearing surface of asphalt or granolithic paving. For the remaining classes sidewalks may be of wood at the discretion of the responsible engineer.

WOODEN FLOORS.

Wooden stringers shall not be used on greater spans than 15 ft., and shall have a width of not less than 3 in. or one-fourth of their depth. They shall lap by each other on the floor beams to give each a full bearing, and shall be bolted together, using washer separators not less than ¼ in. thick, in order to secure free circulation of air.

WHEEL GUARDS.

On wooden floors wheel guards, of 6 by 4 timber, shall be provided at each side of the roadway, and shall be supported on 2-in. blocks spaced not over 5 ft., held in place by a ¾-in. bolt through the guard, the blocking piece and the timber floor. The splices in wheel guards shall be half-lap joints 6 in. long, and shall occur over the blocking pieces.

For permanent floors the wheel guard will generally be formed of concrete effectively protected by steel angle rubbing pieces.

SCUPPERS.

On permanent floors of any description suitable scuppers shall be provided not less than 20 ft. apart, so arranged to carry all drainage clear of steelwork.

LIVE LOADS.

The varied character of the loads applied to highway bridges renders it impossible to include in a general specification a statement of the precise loading to be used on every bridge, and any table of suggested

typical loads must be recognised as necessarily having the following limited purposes:—

(a) To guide the responsible engineer in his choice of a structure in regard to capacity and efficiency.

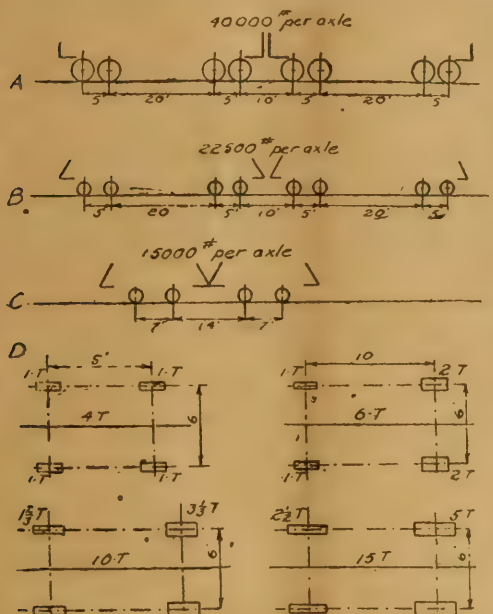
(b) To indicate to non-technical officials or to engineers not specially experienced in bridge work what constitutes accepted good practice.

(c) To guard against the possibility of a structure being provided which is insufficient to meet the immediate requirements or those reasonably certain to occur in the future.

On the other hand, the specifications should not prevent the building of very light bridges, which, while sufficiently strong to withstand the vertical and vibratory loadings, should be able to compete successfully in the matter of first cost and maintenance with the alternative wooden construction. The majority of existing light structures, which would fall under the fifth class, above indicated, have not been built to any of the recognised standard specifications, and, indeed, no present specifications in vogue in Canada permit of this, nevertheless necessary, class of bridge. With the idea of meeting both the financial and service requirements of such cases, the permissible loadings under Class 5, as well as certain other limitations, are less exacting than in the existing standard specifications.

TWO MAIN DIVISIONS.

The loading on a highway bridge naturally falls under two main divisions, the assumed uniformly distributed load and concentrated wheel loads. The



DIAGRAMS OF WHEEL LOADS APPLYING TO STEEL HIGHWAY BRIDGES.

first division will consist, generally, of crowds of people, animals in droves, or a large number of light vehicles. Crowds of people, such as quickly gather at accidents or for sight-seeing on city bridges, are seldom productive of 100 lb. sq. ft. average load, and for moving loads this figure would undoubtedly cover all cases to be provided for at ordinary unit stresses. Classes 1 and 2 are likely to experience such loads at frequent intervals and for almost unlimited lengths, while Classes 3 and 4 may receive the same intensity of loading, but far less often, and over smaller areas. Animals in droves will never exceed 60 lb. per sq. ft., and for Class 5 this would represent the maximum load.

The second division will include all classes of heavy vehicles, such as street cars, auto trucks, horse-drawn lorries, and road-making machinery. Local conditions alone can determine the type and magnitude of loading for which steel should be proportioned.

In bridges of Classes 1 and 2 the proximity of factories, wharves, railway yards, the nature of the street car service, the possibility of loads, due to building materials, cable spools, heavy guns, steam rollers, or traction engines, must all be duly considered in specifying the applied concentrations. It may also be noted here that the authorities owning these classes of bridges are also generally empowered to regulate traffic, and it will devolve upon their executive engineer to consider the principle of equity involved in the question whether the publicly owned bridge should be capable of accommodating some unusual "freak" load, avoidable at a certain cost to the transportation company, or whether the traffic regulations should not control the use of the bridge for such purposes on the basis of engineering economics.

The figures given in the following tables are considered safe maximums for usual cases, and are recommended for adoption only in default of specific information from the responsible engineer.

IMPACT.

The function of the so-called impact allowance is twofold. First, to take care of actual increases in the magnitude of the applied load liable to occur at infrequent intervals. Secondly, to make provision for the increased stresses due to dynamic application of the loads. To the uniformly distributed loads described above only the first aspect of impact will apply, and in so much as same maximum figures are recommended for adoption, no further increment for use at normal unit stresses is considered necessary. To concentrated wheel loads both aspects of impact may be presumed to apply, and a simple percentage of the static load is suggested as the increment. It is believed that the effects of the dead load and the length of the span affected are suitably provided for in this percentage, in so much as the concentrated loads will in general govern floor members only, and the type and weight of floor will bear some sensible relation to the magnitude and ferocity of the wheel loads.

TABLE OF LIVE LOADS.

(1) For floor stringers, cross beams, hangers, and any members of trusses and girders where concentrated wheel loads govern the sections.

	Uniform load.	Street cars.	Trucks, &c. See diagram D.
Class 1	100 lb. per sq. ft.	Diagram A	2-15 ton alongside or following
Class 2	100 lb. per sq. ft.	Diagram B	1-15 ton
Class 3	100 lb. per sq. ft.	Diagram B or C (if any)	1-10 ton
Class 4	80 lb. per sq. ft.	None	1-6 ton
Class 5	60 lb. per sq. ft.	None	1-4 ton

2. For trusses and girders.

	Uniform load.	Street cars.
Class 1.	100 lb. per sq. ft. up to 200 ft., thence diminishing arithmetically to a minimum of 75 lb. at 400 ft.	2,400 lb. per ft. per track for freight cars. 2,000 lb. per ft. per track for passenger cars
Class 2.	100 lb. per sq. ft. up to 100 ft., thence diminishing arithmetically to a minimum of 60 lb. at 300 ft.	2,000 lb. per ft. per track.
Class 3.	80 lb. per sq. ft. up to 100 ft., thence diminishing arithmetically to a minimum of 50 lb. at 200 ft.	1,600 lb. per ft. per track (if any)
Class 4.	80 lb. per sq. ft. up to 80 ft., thence diminishing arithmetically to a minimum of 50 lb. at 200 ft.	None
Class 5.	60 lb. per sq. ft. up to 60 ft., thence diminishing arithmetically to a minimum of 40 lb. at 100 ft.	None

SCOPE AND COMBINATION OF LOADS.

Uniform live load shall be applied to full width of road surface between wheel guards and on sidewalks to the maximum clear width available for traffic. The assumed equivalent uniform live load for street cars shall be applicable to the whole length of the trackage on the span or any portion thereof. Each street car track shall be assumed to occupy 10 ft. width of roadway. The following combinations shall be considered possible.

Street car loads and other concentrated or uniform loads for floor beams and hangers.

Street car loads and half uniform load on remainder of floor surface for trusses of Classes 1, 2 and 3.

When sidewalks are carried on brackets outside of the main trusses, provision shall be made in the trusses for the cantilever effect of loading one sidewalk and the full road surface between trusses with 75 per cent of the specified uniform loading.

IMPACT.

The percentages of the live load from wheel concentrations to be added for impact will be as follows —

To stringers 40 per cent.

To floor beams and hangers and other truss members affected, 20 per cent.

A Survey of Municipal Engineering.

By EDWARD WHITWELL, F.I.S.E., M.S.A., Engineer and Surveyor to the Abersychan Urban District Council, Lieut. R.N.V.R., President of the Institution of Municipal Engineers.

[Inaugural address to the Institution of Municipal Engineers—concluded from last week.]

Many authorities in the early days possessed themselves of baths and wash-houses, and financially met with varying success. Latterly the tendency has been to separate the two, and in the result we find that many more baths are erected than wash-houses, and that, while the former are rapidly increasing in popularity, the latter are not in fact declining. Probably the explanation is to be found in the fact that housing conditions, which are fast improving, include better provision for family washing than was the case a few years ago, and that greater attention is being paid to the physical welfare of the young than formerly.

The swimming bath has generally not been in great favour with the authorities, because swimming has been so little encouraged as to result in high charges in order to try and reduce the expectant amount of loss on the season's working, and in the result for many years progress has been stagnated. Now a different view is being taken, and while the authorities are discovering that the financial exercise provided by this form of sport more than compensates for the slight loss of working, they are concurrently finding that its popularity converts the loss into a profit, and are inclined to wonder why the art of natation has been so reluctantly encouraged. In my own case I found an authority seven years ago just deciding by a single majority vote to provide a swimming bath for a population of 25,000, which within five years builds a second, and would have erected a third by now but for the war.

In the particular instance referred to I may state that, on my advice, the maximum charge for admission is one penny, and that I prevailed upon the county authorities to include swimming in their curriculum, with the result every child (boy and girl) attending the elementary schools in Standard I. [illegible] has the opportunity to attend the swimming baths once weekly absolutely free of charge. I made the arrangements quite complete by providing free instructors, who specially follow the progress of each child, encouraging it in every possible way, and at the present time there are nearly 3,000 children learning or practising swimming. As may be conceived, the baths are really a financial asset, but were it otherwise the district would be more than amply repaid by the better physique of manhood and womanhood, and by the valuable asset possessed by each of being able to swim. Without doubt the provision of facilities for swimming should be as obligatory as many of the other things which are in municipal life, since the investment is really one in which the dividend is to be found in a better and healthier people.

COLLECTION AND DISPOSAL OF REFUSE.

One of the very earliest requirements for the good of the public was the collection and removal of house refuse, but [illegible] in the matter of collection very little progress has been made since the law came into operation.

We all know how exceedingly distasteful and unsightly are the contents of pails of refuse which are either allowed to collect in bins, ashpits, or heaps, and are [illegible] periodically, and we all know how unsatisfactory is the work of the collectors. Granted that a better step was taken in the dissemination of the liquid by the water carriage system of [illegible] effluent seems possible to be found to deal satisfactorily with the remaining crude conditions.

In many towns an exchange of sanitary bins is made [illegible] and the system to date, while still leaving something to be desired, is the most cleanly. At the same time it is the most costly, and generally [illegible] is operating one will find that the collectors have to enter the [illegible] the living-rooms of the occupiers, and [illegible] the front door a most miserable object of offence, and sometimes as undesirable one should pass [illegible] acquaintance be calling upon you when the collector is present, and the latter accidentally [illegible] a portion of the [illegible] on the hall floor. Other methods have their disadvantages [illegible] to be overcome here, though I believe I [illegible] which requires the [illegible] on the part of the [illegible] a certain degree of [illegible] which as often as not falls to the lady of the house; the receptacle which is the happy hunting-ground of all the four-footed animals in the neighbourhood—the same animals are generally most affectionately embraced by the householders or their children within the same hour—and the delight of the mischievous schoolboy who explores it for treasures or empties it into the street, as the mood takes him. Probably the most crude, insanitary and unsightly of all methods of storage and collection is that which is prevalent in some towns I have seen. There huge cast-iron bins are provided, capable of holding from 36 to 100 cub. ft. of household refuse, and are placed alongside the main and other thoroughfares, or on the open spaces, where their putrefying contents are investigated by every dog and cat in the neighbourhood, and where the bins are used very often as excellent hiding-places by the children in their many games. In these big receptacles the refuse is allowed to stand, generally for a week, before collection, and in the result it is found that every wind or gale provides a storm of flying dust, ashes, or paper for the assimilation of any luckless passer-by. Could anything more ghastly, crude, or unsatisfactory be conceived in this the twentieth century?

I have been in a district where this system was actually extending, and, needless almost to state, my advent heralded a change in the procedure, a stop on the extensions, and a rapid deviation from it to something much more satisfactory. Its displacement by the bin system led to much better results, and, by the introduction of bells to the collecting carts, reduced the animal and mischievous boy's evil to a minimum.

The most economical and satisfactory system of storage is, to my mind, however, that provided in the several large housing schemes for which I have been responsible. Here the occupant places the refuse into a receptacle hooked on to a door built with its frame into the wall of the back street, and so arranged that the receptacle cannot be removed from the door unless it is opened. As the only person with the key is the collector who calls and empties the bin three times per week, and as it is protected from cats, dogs and children, it is obvious that, for cleanliness and economy, the system is hard to beat. Personally, however, I am looking forward to the solution of the problem on different lines, and, given the co-operation of the householder to properly limit his refuse to the legal definition, to finding that the model city of the future will be provided with a system of conduits which, having endless travelling floors and openings at all premises, will convey the refuse to definite collecting centres, from whence it can be conveyed, still underground, to the place of its disposal. Such a system may or may not appear to be more costly, but whether it be so or not, we must realise that those systems which are essential to the full and proper safeguarding of the public health are the most economical in the end.

To the question of disposal there can be but one answer, and that is, by burning. A few years ago the remedy, by providing dust destructors, was almost worse than the disease, but with the experience gained and the improvements effected, there is now no doubt that this is the only satisfactory way of disposing of the waste matters. Various patent processes, by which the wastes may be utilised in various forms, may now and again catch the public eye, but a calm consideration of the whole question, and a full realisation of the amount of latent power contained in the refuse, at once disposes of them all.

As yet the public mind has not thoroughly grasped the potentialities of the waste matters of a community, and is rather inclined to regard them as a costly nuisance which must now be dealt with in some more effective fashion than that of dumping on waste lands, but gradually the experience and foresight of municipalities like Blackpool is reaching it, and in consequence we are slowly, but surely, approaching the subject in a more resolute and determined manner. Many authorities, however, do not yet grasp the situation properly, and, while not unfavourable to the erection of these institutions, are opposed to utilising

the latent power therein on the grounds that the destruction of the refuse is the only object, and that this should not be the excuse for a type of municipal trading. And yet the same authorities will plant vegetables on their sewage farm and sell them to those who will buy!

That any authority would permit the latent power of municipal refuse to go to waste is, to my mind, almost unbelievable, and yet in the experience of the members of this institution it is known to be the case. At the same time I think every member is convinced that it is his duty to influence his authority for the public good by persuading it otherwise.

WATER SUPPLIES.

This is a department which falls to the lot of many engineers to control, and, outside the construction of the great bases of supply, chiefly takes the form of administration. With the provisions made to safeguard the purity of the water, which is probably the first essential to human existence after air, most members are well acquainted, while hard-and-fast rules are generally in existence to secure uniformity of distribution. In any event, it is fully recognised that the greatest dangers to the pure supplies of water lie in the distributing channels rather than at the base; hence every precaution should be taken to prevent possible sources of contamination being contiguous thereto.

In many districts the regulations will not permit of the drains, gas pipes, and water pipes being laid in the same trench, and yet in others you will find an absolute disregard of this elementary precaution. In many other matters some authorities are similarly lax in their control, especially in districts where the supply is intermittent, and they may be said to be courting grave danger. Generally, however, this is a department which leaves little to be complained of. From the public point of view but few of us recognise how really cheap this essential to existence is, how lightly we value it, and how freely we waste it.

As is well known, one of the greatest troubles of distribution in some districts is that traceable to corroded mains, and while ingenious contrivances have been found by means of which periodical cleansing can take place, yet none of them safeguard the smaller pipes from the same evil, and consequently an enormous expense is annually incurred in replacements. That some means of actually arresting the corrosion would be infinitely more satisfactory is evident, and I am rather looking to the introduction of some preparation, by a treatment of the conveyers, to bring this about on the principle that prevention is better than cure.

ELECTRIC AND GAS SUPPLIES.

The controversy as to the relative merits of gas and electricity is still being keenly waged with contradictory proofs from various districts as to which is really the most economical. To the engineer who may have both under his control the keenness of the competition hardly appeals, but to one who only has one of them, while a private company owns the other, it is clear that he must keep himself fully alive to all the improvements and devices which will tend to popularise and cheapen the commodity he is dealing in if he is not to be left behind in the race for supremacy. Of course, the limitations to this address prevent one from entering into their respective merits, though I am inclined to the opinion that at present gas appears to hold the sway economically, while electricity leads in every other field.

For public lighting, electricity is rapidly overhauling gas, in spite of the impetus given to gas by the incandescent mantle; and when one reflects on the grave difficulties attending incandescent lighting during great storms, storms in which the electric lamp glows unmoved, one does not wonder at it.

For domestic work, lighting, cooking, and heating, electricity is becoming more in favour by reason of its greater cleanliness, readiness, and safety; though to realise this fully one must visit a town where electricity is supreme. With a greater economy of production and distribution it is quite evident that its application cannot help but soon be universal.

SUPERANNUATION.

The reference to this has been dissociated from the question of security of tenure because, I believe, the two possess no actual relation, and because engineers have a much better prospect of getting them separately. At the present moment it is fully realised that this is a question which must of necessity stay in abeyance until the more pressing problems of the war have been dealt with, but it is timely to refer to the matter with a view to its claims being considered just as soon as circumstances permit, and in the hope that the illogical position of the only public department without adequate provision for superannuation, whether by self-contribution or otherwise, shall be removed.

OTHER DEPARTMENTS.

There are many other departments in which the municipal engineer is interested, and concerning which he has to be more or less of an expert,—namely, building, private street work, public vehicle control, pleasure grounds, allotments, &c., of which the two former require the exercise of more diplomacy, with firmness, than the rest. In the matter of building by-laws, everyone knows how difficult it is to secure exact or uniform compliance when some of them, which an unbending bureaucracy insists on retaining, are as absurd as it is possible for them to be, and when, on the other hand, a weak authority permits of the occasional disregard of the most essential, I think it may be safely said that building by-law enforcement has placed the public official more often in an unenviable and regrettable position than all the other departments together, and this enforcement alone has fully justified the official claim for Government protection in the way of security of tenure. Whether the simplification of the by-laws on sensible lines will lead to more co-operation on the part of the builder is a matter of doubt, while to permit of building without by-laws would lead to his return to the erection of the slumdom which is the blot on the present day, and which is being in many districts granted attenuated life by generous, though oft shortsighted, authorities. One of the most frequently repeated arguments that the surveyor meets with is that these are "by-laws made in London largely to suit London, and consequently it is absurd to build as if you were in London." A remodelling on sensible minimum lines, with an inclusion of other requisite provisions, would greatly assist the official responsible for the present difficult task.

THE TRAINING OF THE ENGINEER.

I do not think that this address would be complete without some reference to this very important matter. Time and time again the matter has been brought to the notice of the professional world that it is as important to provide the future engineer with a thorough base on which the structure of his professional attainments can be built as it is to provide proper foundations for a heavy edifice; and the general conclusion is that the stronger the foundations are the more it is possible to build upon them. All this is perfectly true, for it is inconceivable to think that all engineers without this preliminary preparation would be as fitted as they are to-day if this had been denied them; but it is also perfectly true that many engineers fail to build upon the foundation given them the structures for which the foundation has been prepared, and this is a great matter of regret. The lackadaisical system which still prevails of selecting a profession for the child without regard to its fittedness or bent has led in the past to many failures, while, on the other hand, some of the leading engineers of the day are men whose early training was not strictly confined to the sphere in which they have met with so much success. In other words, men without that early academical and professional training which would without doubt have greatly facilitated and accelerated their progress have outstepped many who have had every facility given them and every opportunity open to them, because of their greater fittedness for their professions, and because of the general inadaptability of the less successful man. Undoubtedly the first step in the making of an engineer is to see that his natural bent is inclined to that end; the second, to commence at the earliest possible moment to encourage that bent; the third, to provide academical and professional training by attractive, efficient, and effective methods. If then the budding engineer has the courage, the tenacity, and the personality, he will succeed, and be an asset to the engineering world.

To the engineer in the embryo stage I would emphasise the great need of his pursuing his studies until he is capable of taking the institution's examination, and then of diligently continuing to keep pace with the progress being made in the departments in which he is interested until he has attained all the success of which he is capable in the sphere in which he works. He may have many years to run, but all the time he runs he approaches nearer and nearer the goal of success, he leaves further and further behind the starting point, and he finds fewer competitors to vie with him for the best that the profession holds, and

all the time the engineering world is profiting by his diligence.

GENERAL.

Before concluding this address I should like again to express my deep appreciation of the very high honour which has been bestowed upon me and on the municipal authority it is my pleasure to serve, and to express the determination to further the aims and objects of the institution by all means that are in my power during my term of office. During the period of my membership of the council and of my association, as an associate with the presidents, the fellow vice-presidents, and secretary has afforded an unbroken pleasure and I am looking forward to continued happy associations in fulfilling the aims and objects of the institution. Particularly have I to express my sincere appreciation of the cordiality and assistance given me by the retiring president, Mr. H. C. Adams, the geniality and helpfulness of the past-presidents, Mr. Matthews Jones, Mr. H. Stickland, Mr. H. Boot, and others, and to the happy and co-operative relations with our excellent and painstaking secretary, Mr. Wyand. These gentlemen are the pillars of the institution, and it is to them that the institution owes so much of its splendid success.

I must again also express the fervent hope that before another annual meeting we shall experience that happy reunion with our brothers who are fighting side by side for the honour of Old England, and that it shall mark the dawn of a lasting and honourable peace which shall know no end.

Following the reading of the foregoing address at the annual meeting of the Institution of Municipal Engineers a vote of thanks to the president was proposed by Mr. H. C. H. Shenton. In seconding, Mr. L. C. Barrable remarked that there were evidently many other excellent things coming out of Wales than a certain distinguished gentleman who would be nameless.

The proposition was carried with acclamation.

Ystradgynlais Council Offices.—The Ystradgynlais Rural District Council's new offices in Glanley-street were opened on the 11th inst., the ceremony being performed by Mr. Thos. Watkins, who has occupied the post of surveyor to the council and their predecessors the Ystradgynlais District Highway Board, for a period of thirty years.

The Rainfall of 1916.—At the last meeting of the Thames Conservancy Lord Desborough, the chairman, said he had received figures as to the rainfall from Oxford west which had been corrected by comparison with Dr. Miller's records with which they substantially agreed. Their own figures were taken at ten different stations in the Thames Valley, and were very interesting. During the year 1916 they had almost exactly the same amount of rain as they had in 1915—27·5 in. It was rather interesting to note that the last five years had been very wet years, the average rainfall being 33·8 in., which compared with 27·2 in. for the preceding twenty-nine years. It would be very clear also that for the past five years the excess of rain had been very large. Last year, in regard to the volume of water with which they had to deal in the Thames they touched record figures. The year 1915 was up to that time a record year in that respect, but it was beaten last year when the volume discharged at Teddington was far greater, and surpassed anything that had been known since the records had been kept. That excessive flow was no thought largely accounted for by the fact that the soil was already heavily charged with moisture, it had the effect of increasing the flow at Teddington were from 1,600 to 6,250 million gallons. What was going to happen in the future he did not know. Some time ago Sir Norman Lockyer suggested that rainfall and drought ran in decennial cycles. There was no doubt that cycles of wet years ran down to a minimum, and then climbed to a maximum. They might have to face a drought, but he did not think it was possible that they could go on with these extraordinary rainfalls for many more years. The total flow of water at Teddington last year reached the colossal figure of 574,057 million gallons.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Are not the reports of the meetings in the January issue of the *Journal* of the Institution of Municipal and County Engineers rather belated when we find that these reports are of meetings which took place in September of last year? Is there much benefit to be derived from such reports, which were duly published in certain professional journals directly after the meetings had been held?

* * * *

Was it not rather disappointing to find in last Sunday's *Observer* that the leading article, which was headed in large letters "DOWN WITH THE DUST," did not refer to some improved method of street cleansing, but merely to the new War Loan?

* * * *

Will the Cornwall County Council be able to persuade "the authorities" to let them employ German prisoners in their road stone quarries in order to free men for other work? If this council is successful in their appeal, is it not to be hoped that other local authorities will follow their example? Would not the prisoners themselves be only too glad to be employed in useful work, and thus find relief from the terrible monotony of idleness?

* * * *

It, as stated in the public Press, the Northampton County Council are confronted with an estimated expenditure of £200,000 on road works after the war, what is the estimated total amount which will be required throughout the United Kingdom to put our sadly neglected roads in order after peace has been declared?

* * * *

Are not the "suggestions for the preparation of specifications for concrete roads," which appears in this month's issue of *Concrete and Constructional Engineering*, exceptionally good? If the details there set forth could be scrupulously followed, ought we not to find that good concrete roads can be properly constructed in this country as well as in America?

* * * *

Was not the article in the *Architects' and Builders' Journal* of the 3rd inst., entitled "A Forgotten Town Planning Scheme for Westminster," an object-lesson to the present generation of how an excellent scheme by an engineer or an architect may be muddled and spoilt by officialdom? Does it not seem grievous to contemplate that the sad-looking Victoria-street might have been a magnificent boulevard, practically bringing St. James's Park into touch with it, and that all this was spoilt because the Government of that day insisted on building the hideous Wellington Barracks where they did?

* * * *

Does it not seem as if there is "something wrong somewhere" when we find that, although there is a shortage of labour for growing vegetables and other foodstuffs, a gang of men are taking up and relaying turf in Battersea Park, and this on a part of the park where the public are not allowed to walk?

* * * *

Where do the people of Tintern Parva and Chapel Hill, in the rural district of Chepstow, now obtain their water? Is it not evident from the report given of a recent meeting of the rural district council that there must be something very wrong indeed with that supply when we find that a school at Tintern Parva was without any water supply whatever, and "that the matter had been under discussion for five years"? Is it not rather astonishing to find in many rural districts an entire absence of any appreciation of that wise adage, "Penny wise and pound foolish"? And does it not make us wonder sometimes whether the promotion of parish councils was a wise measure?

* * * *

May the writer of these paragraphs be permitted to draw attention to a printer's error in his first paragraph of last week with reference to the manner in which Nature is always trying to override and efface man's handiwork? In referring to the wild flowers, weeds and grasses which spring up like magic on sites of old buildings, it is stated, "Where do the *woods* come from?" The word should, of course, have been *seeds*.

Experiences in Water Filtration.*

By H. G. HUNTER, M.CAN.SOC.C.E., Resident Engineer in Montreal for the New York Continental Jewell Filtration Company.

Rapid sand filters is a generic term implying two essential types of filters, the gravity and the pressure. The gravity filter is one wherein the water is passed through the filtering medium by the force of gravity. Such filters are contained in open tanks, and the raw water always passes through a coagulating period before reaching the filter. The pressure filter is enclosed in a steel tank, and operates under pressure. The arrangement of the underdraining systems is quite similar in both types of filters, and each has a bed of filtering material of about the same kind and depth of sand. The chief difference is, as before stated, in that one operates under pressure and the other by gravity. The pressure filter requires less space than the gravity filter, and is particularly applicable in certain cases where it is desired to avoid double pumping of the water, the filter then forming a part of the continuous piping system between the raw water pumps and the distribution system.

The gravity filter is of far wider usage, since it appears to be somewhat better suited to all-round conditions; but it must not be forgotten that there are numerous cases where the pressure filter will prove distinctly better.

PREPARATORY TREATMENT OF WATER FOR FILTRATION.

In preparing raw water for gravity filtration it is always essential that it first be freed of a substantial percentage of the impurities it contains in order not to unnecessarily overload the filter, and thus unnecessarily decrease its reserve capacity and increase the cost of its operation. This preparatory treatment may be effected by long storage, whereby the suspended matters are separated out of the water by sedimentation, or by coagulation and sedimentation, in relatively small basins. The latter procedure is the one most commonly followed, since its effect is quicker and far more thorough, and its cost far less.

In the preparatory treatment last mentioned an iron or aluminum salt is used as a coagulant, and sometimes a mixed salt of these two bases.

In Canada sulphate of alumina is used chiefly. The action which is brought about by adding the aluminum salt to water was discovered thousands of years ago in China, and results in the release in the water of a flocculent, neutral hydrate of aluminum, which attracts and enmeshes the suspended and colouring matters in the water, including the bacteria, and thus forms relatively large aggregates, which settle out rapidly in basins designed for that purpose. Such of the coagulated matter as passes the coagulating and settling basin is strained out by the filters, and a clear and colourless filtered water results.

The basins in which the raw water is prepared for filtration are of various types. Some are rectangular in plan, some square, some circular, their shape and size depending chiefly upon the character and volume of the water to be treated, and sometimes upon the topographical conditions met with.

The design embodies well-known and essential features. First, the basin is divided into two compartments, so that one half may be cleaned while the other is in use. It is important that the water enter the basin evenly throughout its width, and we find that to deliver the water at or near the surface is good practice. The effluent should be taken from near the surface and evenly over the width of the basin. In a straight-flow basin it is not found that baffles are necessary, other than that it is well to arrange to stop a "short cut" surface flow with a baffle near the inlet end.

In other basins where baffles are used, sudden and violent fluctuations in velocity of flow are avoided so far as possible, in order to prevent the breaking up of the forming coagula. Baffles are advisedly placed here and there in these basins to prevent the undesirable short-circuiting, and the cross-sections of the passages under and around these baffles are computed to a considerable degree of nicety in order to avoid sudden increases in the velocity of flow, which would not only tend to break up the forming floes of hydrate, but sweep along with the flowing current matters already brought to rest on the bottom of the basin.

It is necessary to have drains of ample size from a sump in the basin, and gates on these located in a dry chamber. There should also be arranged an overflow of adequate dimensions. It is very convenient to provide water under pressure, inside of the basin, where a hose may be attached for washing out the deposits. In this climate the basins must be decked over and covered with earth to prevent freezing, which necessitates manholes properly located for access and lighting.

APPLICATION OF COAGULANT SOLUTIONS.

No department of the purification process is more important than that wherein the coagulant solutions are applied to the raw water as it enters the coagulating and settling basins. As the character of the raw water changes, the dose of coagulant must be changed accordingly, and unless this is done intelligently, not only are poor filtration results to be anticipated, but a material waste of coagulant is unavoidable. This coagulant costs money. Probably all of one-third of the cost of operation of a filter plant is represented by the cost of the coagulant. Insufficient coagulant means poor results, and too much coagulant means unnecessary waste. If the filtration result is unsatisfactory through the use of insufficient coagulant, its cost has been largely thrown away, since no better than a poor result has come from its employment.

Where the devices for preparing coagulant solutions and the application of the same are clumsy, primitive, or require a great deal of manual attention, the dose is liable to fluctuate sharply from time to time. This means alternate under and over dosing, which runs into considerable waste money. Our company has centered a fair share of the efforts of its designing staff on endeavours directed specifically to the perfection of appliances whereby the preparation and application of coagulant may be made substantially automatic and fool proof, and where a constant known quantity of solution can be fed, and the quantity conveniently and quickly changed as desired.

There must be arranged in the plant a chemical storage room, chemical solution tanks, and chemical feeding devices. The storage room should be arranged for convenience in getting material into it and in moving the material. The solution tanks, if possible, should be arranged so that the top of the tanks comes at the level of the storage room floor. There should be two solution tanks. The capacity of one of these tanks should be figured to suffice for at least twelve hours' supply, under the maximum quantity of solution needed. The tanks are arranged with dissolving racks, in which the sulphate of alumina is placed, spray pipes for directing the water on to it, and agitators for keeping the solution agitated and of uniform strength. Various arrangements for these solution tanks are satisfactory, and from experience I would avoid only agitators operated from counter shaft, where belting and gearing is required. It is doubtful if it is good practice to use electric motors for driving the agitators. A water-motor driven agitator for each tank is in every way a satisfactory arrangement. Where concrete tanks are used, some arrangement for protecting the concrete must be provided. A solution of sulphate of aluminum will attack concrete, and in a short time eat away the surface of the concrete to a considerable extent. Present experience indicates that if the surface of the concrete, when dry, is treated with creosote oil and "Barrett specification pitch," it will remain unimpaired for years.

The piping from a solution tank will, of course, provide for drainage and also for taking the solution from the tank to the chemical feeding devices. The solution on passing from the tank should be filtered. This filter should have an area, so that the rate of filtration will be about 1·66 imperial gallons per square foot per minute. It may be arranged in the bottom of the solution tank or outside of the tank. Provision to wash back with clean water must be made. The filtering material is gravel, ranging in size from ¼ in. to 1 in. and the thickness of the material from 4 in. to 6 in. This [illegible] for filtering alum is most important, particularly as

* From paper read before the Canadian Society of Civil Engineers.

the small plants, and has been brought about entirely through experience.

The measuring devices for feeding the coagulant solution after filtering can be any arrangement whereby a constant known quantity of solution can be fed, and by which this quantity can be conveniently and quickly changed. The solution from the feeding devices can be conducted to the point of application in lead pipe, or chemical hose, either by pumping, so as to feed by gravity, or through a pump suction box to feed to the suction of the low-lift pumps.

CONSTRUCTION OF THE FILTER PROPER.

The rate of filtration adopted for mechanical filters is 104,000,000 imperial gallons per acre per day, or 1·66 gallons per square foot per minute. The general arrangement of modern filters is well known. The filter shell is usually made of reinforced concrete, rectangular in shape, and 7 ft. or 8 ft. deep. It is equipped with a strainer system at the bottom, about 36 in. of filter sand and gravel, and wash-water gutters at the top. Outside of the filter in the pipe gallery are located the pipes and valves for operating the filter.

The strainer system may be the combined or separate air system. On the design of the strainer system largely depends the uniform rate of filtration. This is so for two reasons—first, it must collect the water passing through the sand in uniform quantities over the whole area of the bed; secondly, it must distribute the wash water at a uniform rate over the whole bed. The distribution of the wash water is the most important detail to have correct in the filter. If this is defective, or the waterways are too small, the washing of the bed is not uniform, and in a short time there will be alternate areas of clean and dirty sand.

The design of a strainer system for a bed having an area of 150 sq. ft., or less, should not be used for a bed of greater area—that is to say, a central manifold casting from which lateral pipes branch each way to the sides of the bed can be supplied with water from one end, while in beds of greater area the manifold pipe should receive its supply at the centre, or in very large beds, at two points. It is probable that a bed having an area of 420 sq. ft., which would equal a million imperial gallon unit, should be designed with a manifold at each side and the lateral pipes laid between them, thus effecting a pipe system without dead ends. The manifold and lateral pipes should be of cast iron. In filters of small area, however, genuine wrought-iron pipe is used for laterals.

The strainer caps or strainer heads, sometimes called sand valves, are of numerous and widely varying designs. Many of them are covered by patents. They are made of brass or bronze, and so designed that the flow of water through them is broken up and equally distributed. Where the combined air and wash-water system is used a brass trap tube is usually required.

CARE IN PLACING STRAINERS.

The placing of the strainer system in the bottom of the filter should be done with great care, particularly if the combined system is used. It is very important that the strainer caps be practically level throughout the area of the bed, and a variation of over ½ in. is not permissible. Strainer caps should be spaced not more than 6 in. on centres. After the strainer system is in place, the whole should be embedded in lean concrete and the surface finished off with a layer of good cement mortar about ½-in. thick. This surface should be brought level with the lowest waterway to the strainer head.

Nine inches of properly graded gravel placed in the bottom of the bed is apparently sufficient. This gravel should be graded in size from ⅛ in. to ¼ in. On top of this 27 in. of carefully selected silica sand should be placed. The grading and the size of the sand is important from an economical point of view. If a sand not properly graded—that is, containing too large a percentage of fine particles—is used, the fine particles will eventually be washed out, and it will be necessary to replace the material so lost. On the other hand, if the size of the sand is not larger than ·60 millimetre, and smaller than ·37 millimetre, with a uniformity coefficient of 1·65, practically no waste will occur from fine particles being washed away.

Wash-water gutters are constructed of concrete, cast iron, steel and wood. The writer's experience has been with cast-iron gutters, and they have been found satisfactory. The top edges of the gutters should be placed to a straight line, so as to permit the lip of all the gutters in the bed to be set at one level. The distance above the surface of the sand at which these gutters should be placed depends upon what the rate of application of wash water is to be. If filter-washing is to be aided by compressed-air agitation, then a vertical rise of wash water of 13 in. per minute will suffice. If no air is used, but dependence laid upon what is known as the "high velocity wash," as used at Cincinnati, Ohio, and elsewhere, then a vertical rise of wash water of 30 in. per minute is not uncommon. Naturally, the whole sand bed is floated when wash water is forced upwards through it, and the higher the velocity of upward flow of this water the higher the sand layer will rise. Consequently, to avoid loss of sand, the wash-water gutters must be placed sufficiently high so that, whatever rate of application of water is employed, the filter sand will not be washed out of the tank and so lost. The capacity of the gutter should be such as to carry off the flow when running within 1½ in. of full. It is important that the drain be so laid that air will not trap and cause a back-flow.

WASH WATER AND AIR APPLICATION DEVICES.

The washing of the bed by first applying air to agitate the sand and then the water can successfully be done with a quantity of water that will equal a vertical rise of 13 in. per minute. In filter beds where air is not used for agitating the sand, but where revolving rakes are used for agitating, a vertical rise of 12 in. per minute is sufficient.

Air for agitating the sand previous to washing should be supplied under a pressure of from 3½ lb. to 4 lb. per square inch. The quantity of air should be not less than 3 cub. ft. of free air per square foot per minute. A proper wash of a filter bed is often accomplished by agitating with air for two minutes and washing with water for four minutes.

Where air and water is adopted to wash filters, the wash water and air agitating equipment must be arranged to meet conditions. On small plants—that is, beds having an area of 65 sq. ft. or less—the wash water may be obtained direct from the mains without dropping the pressure too much to cause annoyance. On plants larger than this and up to filters having a capacity of 1,000,000 gallons, a wash-water pump is usually used. This pump should have sufficient capacity to furnish the required amount of wash water, and be able to lift this water against a head equal to 16 ft. above the lip of the gutter. The most convenient power to drive the pump is electricity, and where electricity is used the starting device should be installed at a convenient point on the operating floor. Where units of 1,000,000 gallons capacity or more are used, and particularly in plants of 10,000,000 gallons or greater capacity, it is probable that a wash-water tower will work out to be more economical in operation and more efficient in service. The capacity of a wash-water tank should be sufficient to wash one quarter of the filter units in succession. The storage capacity necessary for this quantity of water should be above a point 16 ft. above the lip of the gutter. In connection with the storage tank there should be a regulating tank, or regulating device, that will drop the pressure of the water above the 16-ft. level to 16 ft., and maintain it at this level. Another factor that may work in and make a wash-water tank desirable is the load that can be thrown on to the power available. A centrifugal wash-water pump for 1,000,000-gallon unit will usually require a 50-h.p. motor. This load of 50 h.p. may be thrown on at any time during the day for a matter of four or five minutes. When using a wash-water tank a very small pump and motor is required. This pump and motor should have a capacity to restore in six hours the amount of water estimated for washing. This pump is started and stopped automatically by the pressure of water in the wash-water tower, or by a float. Filtered water should always be used for washing.

The air for agitating in all plants up to 1,000,000-gallons capacity may be supplied direct from a rotary blower. Electric current is the most convenient for the motive power. The blower should deliver the air against a pressure of 3½ lb. to 4 lb. A blower of sufficient capacity to agitate a 1,000,000-gallon unit will require practically a 50-h.p. motor, and it may be, as stated above, that the available power will not permit of throwing as great a load as this on to the power. In connection with the wash-water tower an air-storage tank can be arranged. This tank is simply an inverted tank, similar to the arrangement for a gasometer, in the wash-water tower. The air is supplied to this tank by rotary blowers of small capacity, working the same as the smaller wash-water pumps. The storage capacity should be for

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sufficient air to wash one quarter of the filters in succession. The required air pressure is easily obtained by loading the tank with concrete.

A combined wash water and air tank, as described above, is used at the Montreal Water and Power Company's plant. In fact, this was the first combined air and wash water tank ever constructed, and the outfit as installed is satisfactory.

STERILISATION OF THE EFFLUENT.

Almost every filter plant in operation to-day is treating the filtered effluent with a sterilising agent, hypochlorite of lime, or liquid chlorine being used. Hypochlorite of lime, however, is being replaced by the use of liquid chlorine. There are liquid chlorine feeding devices on the market which are operating satisfactorily. The author's experience has been altogether with the Wallace and Tiernan chlorinators. Their solution feed machines are entirely satisfactory, and for small plants the machine operating with a pulsating motor is particularly satisfactory. The feeding of chlorine gas to the effluent passing from the filter plant, proportional to the amount of water flowing, is a problem requiring a good deal of study. There is no question but what the ideal way to chlorinate would be to chlorinate the effluent from each filter, or to collect the effluent of all the filters into a comparatively small area and chlorinate the water as it passes to the storage in the clear-water basin. Any such arrangement as this, however, runs into so many complications that it does not seem feasible. Where a Venturi meter can be arranged on the discharge line from the high-service pumps, the velocity head through the motor can be used for operating the chlorinator, and the chlorine solution fed to the suction of the pumps. Where such a meter cannot be arranged, a special Venturi tube can be installed at the outlet of the clear-water basin, and the velocity head at the throat utilised, feeding the solution through a distributing pipe, directly in front of the outlet. It is, however, important, and much to be preferred, that an automatic proportional feed machine be used on plants of large capacity. On smaller plants satisfactory results can be obtained with manual-control machines.

Workmen's Houses for Dunbar.—The Town Council of Dunbar have decided to inquire into the question of securing sites for workmen's houses.

Municipalities and Housing. — Dr. D. Axwell Williamson, medical officer of health for Edinburgh, speaking at the Labour housing conference at Glasgow recently, said the authorities were only wasting air on the housing question. No solution need be looked for through the operation of private enterprise. Housing schemes should be undertaken by municipalities with financial assistance from the Government. Much greater control over land in and around cities should be vested in the municipalities for that purpose.

RESTRICTIONS ON MUNICIPAL EXPENDITURE.

OVERCOMING A DIFFICULTY AT SURBITON.

An illustration of the difficulties which are being experienced by public bodies at the present time in obtaining official sanction to expenditure on even the most necessary matters is afforded by a discussion which took place at the last meeting of the Surbiton, Surrey, Urban District Council.

The Sanitary Committee presented a report of the proceedings at a special meeting held to consider further the proposed purchase of electrically propelled vehicles for the collection of house refuse in the district.

The clerk (says the *Surrey Comet*) reported that Sir John Snell, with the surveyor and himself, attended at the offices of the Local Government Board, and urged the necessity of the council being permitted to purchase two electrically propelled vehicles for the collection of house refuse, and to pay for them by instalments spread over three years. The board's representative said it would be necessary for them to consult with the Treasury, and that formal application should be made by the council in writing, setting out the details. This application had accordingly been prepared and forwarded to the Local Government Board. It was also reported that the sanction of the Ministry of Munitions would also be required for the manufacture and delivery of the vehicles, and Sir John Snell had assisted in drawing up an application to them in this behalf. The clerk further reported that, in his opinion, the committee must consider the possibility of the board refusing the application, as it was quite apparent from the interview that they were unwilling to grant any application of this nature at the present time.

After considerable discussion the committee came to the conclusion that if the Local Government Board, or the Treasury, were to refuse their sanction to the proposed purchase of two vehicles by means of instalments, the following alternative might be adopted—*i.e.*, to purchase one vehicle for cash this year, and, if possible, to hire a second vehicle for the period of one year, giving the makers an undertaking that such vehicle would be purchased by cash at the expiration of that period, or, in the event of the makers being unable or unwilling to lend a vehicle on hire, that the collection of house refuse should be done by one vehicle purchased for cash, with hired horses and carts.

From the figures placed before the committee by the clerk, it appeared that the financial effect of this arrangement would ultimately be more economical than the purchase of two vehicles by instalments, but in the first and second years the cost might be slightly higher, though this would depend largely on the terms upon which an electric vehicle could be hired. In any event the difference would not be large enough to require any increase in the rates, beyond such increase as would be required if two vehicles were purchased by instalments. If the course suggested was adopted the sanction of the Local Government Board or the Treasury would not be required, although the permission of the Ministry of Munitions would still be necessary.

It was mentioned that, as the council would soon have to consider the question of renewing the dust-removal contract, the committee thought it wise to have an alternative scheme ready, in case their original scheme did not go through.

The chairman said he understood that the makers of the vehicles were quite agreeable to the council purchasing one and hiring another. The cost of hire for one year would be £60. Either of the alternative schemes was good, providing the original scheme did not go through.

Mr. Packham asked if the £60 paid for hire would be taken off the purchase price.

The chairman: No; it represents 6 per cent interest on the outlay.

Mr. Willcocks asked whether a careful and conservative estimate had been made as to the cost of this new departure.

Mr. Kavanagh replied in the affirmative. Everything that could be thought of, with the exception of insuring the vehicles, had been done. Properly worked, he had no hesitation in saying the new dust-removal scheme would be a success.

In reply to Mr. Willcocks, the chairman said it was hoped to acquire the new vehicles without raising the rates.

Mr. Shaw expressed the fear that the purchase-money would find its way out of the country, but sug-

informed that they had the assurance that the manufacturers were an English firm.

In the end the following recommendations, submitted by the committee but slightly modified by the Council, were adopted: "That, in the event of the Local Government Board or the Treasury refusing to sanction the purchase of two electric dust vans by means of instalments spread over a period of three years, the council purchase one electric dust van this year, that the Surveyor's Committee be authorised to give Edison Accumulators, Limited, an order to proceed forthwith with the manufacture of one electric dust van, and to inform them that if the council do not obtain the sanction of the Local Government Board to purchase the vehicle by instalments, the council will purchase one vehicle for cash, and take another electric van on hire for the period of twelve months, from April 1st next, upon the understanding that the council will purchase the vehicle for the sum named in the specification at the expiration of the twelve months."

CORRESPONDENCE.

Ῥᾴκ ἀνὴρ ὃν πείθ' ὁρᾷ
(One rarely sees a man who knows everything.)
—EURIPIDES.

THE DESIGN AND COST OF RESERVOIRS.

To the Editor of THE SURVEYOR.

SIR,—I have read with interest the letter signed "Water" which appeared in your issue of the 29th ultimo criticising the paper which was recently read by Mr. Binnie before the Institution of Water Engineers on the Cross Hill service reservoir, which is being constructed for the Birkenhead Corporation.

As an old pupil of the late Dr. G. F. Deacon, I am in agreement with "Water" in admiring his work, which was always bold and original, and as resident engineer on this scheme I am glad to have the privilege of carrying out work designed by Messrs. Sir Alex. Binnie, Son & Deacon, which is in some respects as original as any of Dr. Deacon's designs.

The criticisms are chiefly directed towards showing that the work could have been otherwise designed so as to be cheaper, and the writer of the letter affirms that Mr. Priestley was on solid ground when he stated in the discussion which took place that the roofing of such reservoirs added 50 per cent to the cost.

Now, the actual facts are that the entire roof of the reservoir, including the pillars which support it, cost less than 25 per cent of the total expenditure.

It is obvious that the roof can be designed so as to add to the stability of the side walls, as the overturning moment when the reservoir is empty, due to the embankment behind the side walls, can be taken almost to zero, and it was brought out in the paper how full advantage was taken of this fact to economise material in the design of the side walls.

I stated in the discussion that the economy was so great that the addition of the roof did not, in fact, increase the cost of construction, and in making that assertion I assumed that, owing to the large radius for a reservoir of this capacity, it would not be necessary to use the horizontal arch for any increase in stability.

"Water" further criticises the roof because of its ornamental character and appears to suggest that appearance, and not economy, was considered in its design. He gives, however, the cost of a flat reinforced concrete roof to cover a circular reservoir of similar area as being £21,000. As the actual roof cost considerably less than that figure, it is difficult to see what advantage could have been obtained in adopting that form of construction, and it must be borne in mind that the roof is an essential part of the design of the reservoir, in addition to the stability of the side walls, as already explained.

"Water" further suggests that the reservoir could have been more cheaply designed if made circular in plan, and gives an estimate of the cost of a circular reservoir of equal capacity to establish this contention. Now, in order to compare the cost of the two designs, the same unit prices should be adopted in each case. In many cases, however, the unit prices which "Water" adopts are far below what were actually paid. The concrete on the floor, which he puts at 2s. 6d. per cubic yard, actually cost 5s., the concrete which he places at 22s. and 25s. per cub. yard, was actually paid 26s. and 28s. similarly, the setting and straining and the drainage, for which he puts down the sum of £925 and £1,000 respectively, actually cost considerably more. All round his unit prices, the cost of a circular reservoir works out at £69,000, but, taking the actual rates paid at Cross Hill, the £69,000 is increased to about £85,000, as against £73,000, the cost of the actual reservoir, and it is therefore apparent that the structure as designed is more economical than a circular reservoir.

"Water" raises questions as to expansion joints in the walls, and also as to asphalting the whole of the roof. Mr. Binnie dealt with these points in the paper, and explained the arrangements designed for localising and dealing with temperature cracks if they occur in the walls, and the provision made to locate temperature cracks at the groins, and how such cracks are dealt with so that there is no leakage.

The figures of the costs of reservoirs quoted by "Water" are interesting, but such comparisons must only be applied when the local conditions are similar. One of the main factors which enters into the question of the cost of these works is the facility for getting materials to the site.

I must apologise for taking up so much of your valuable space with this letter, but some of the points raised by "Water" appeared likely to mislead if they remained unchallenged.—Yours, &c.,

R. F. BAKER.

Resident Engineer's Office,
Barnston,
Birkenhead.
January 8, 1917.

To the Editor of THE SURVEYOR.

SIR,—The writer wishes to point out two printer's errors in his letter in your issue of the 29th ult.—viz., "J. F. Deacon" should be "G. F. Deacon," and "slim roof" should be "thin roof."

With regard to Mr. Dixon's letter, the writer quite appreciates his irony. As Mr. Dixon suggests, the writer is an obscure individual, but he holds the view that scientific institutions entirely fail in their purpose when they become mutual admiration centres, and he has, accordingly, ventured to put forward a few facts relating to reservoirs.

Mr. Dixon rightly praises the description of the work, but he abstains from giving his reasoned views on some of the fundamental considerations.

With reference to Mr. Dixon's last paragraph, the writer instanced a recent estimate of £1,900 per 1,000,000 gallons for an open masonry reservoir on a hard rock site, and Mr. Dixon is no doubt aware that the two largest masonry reservoirs in this country—Long Newton and Frankley—were constructed for very considerably less than that figure, although they are not circular, and they have dividing walls of the full depth.

In view of this, Mr. Dixon's remark "that the cost of the covered reservoir (£2,625 per 1,000,000 gallons) justifies its adoption," is not quite clear.

It is interesting to note that in "The American Civil Engineer's Pocket-book" (1911), p. 951, Mr. Allen Hazen, one of the ablest living hydraulic engineers, gives the following:—

COST OF COVERED MASONRY RESERVOIRS.

	£ per million gallons.
Small reservoirs and reservoirs on difficult sites	3,750—5,000
Large reservoirs and reservoirs on favourable sites	1,750—2,000
Common figures are	2,500—3,000

COST OF OPEN DISTRIBUTING RESERVOIRS.

Common cost	625—2,500
Common figure for a medium-sized reservoir on a favourable site	1,000

As a recent example of a large open concrete reservoir with gravity retaining wall, we have the Rochester reservoir, completed in 1908 (consultant, the well-known engineer, F. P. Stearns); capacity, 120,000,000 gallons; cost per 1,000,000 gallons gross capacity, £880. This is an oblong reservoir, on a favourable site (*Engineering News*, October 27, 1910).

Briefly, Mr. Binnie appears to contend as follows:—

	£ per million gallons.
Cost of ordinary masonry covered reservoir...	5,000
Cost of Cross Hill reservoir	2,625
Cost of masonry uncovered reservoir ...	2,625 +

The writer contends as follows:—

Cost of ordinary masonry covered reservoir, about	2,450
Cost of ordinary masonry uncovered reservoir ,,	1,650

(All figures relate to the Cross Hill site in 1913.)

—Yours, &c.,

WATER.

January 15, 1917.

THE METRIC SYSTEM.

To the Editor of THE SURVEYOR.

SIR,—My attention has been attracted by your article on the metric system in your issue of the 12th inst. As pointed out by me in your issue dated October 13, 1916, p. 330, we already possess a native metric system and decimal coinage, and need no other. No other system, indeed, can ever be an improvement.

Our teaching of British weights and measures and currency is bad. We mix up the units, and produce an artificial and unnecessary confusion. Until this is remedied the system will always present undue difficulty to students. Unfortunately, national education is largely controlled by decimal or metric advocates, and in their enthusiasm they cannot think in anything but tens, much in the same manner that a cobbler thinks there is "nothing like leather."

There is nothing to prevent, in wholesale and foreign trade, in all calculations and paper checks, and in accounts, the immediate use of—

(*a*) Tons, sacks, and decimals of sacks.
(*b*) Metres of $1\frac{1}{10}$ yards, and decimals of metres.
(*c*) Pounds sterling, florins, and decimals of florins.

It is unnecessary to disturb any person employing pounds avoirdupois, shillings, pennies, and farthings, or yards, feet and inches. There is no system so democratic as the British, because it helps equally the poor with the rich, the manual with the brain worker, retail with wholesale trade, the customer with the dealer, decimal as well as vulgar fractions.

As regards our coinage being decimal, we can consider the florin as divided into 100 cents of account (not coined). Then—

The shilling = 50 cents.
The sixpenny-piece = 25 cents.
The threepenny-bit = $12\frac{1}{2}$ cents.

And the threepenny-bit (the practical limit in wholesale trade, if quotations are made by the British kilogram of 2·24 lb.) is, for the practical convenience of retailers, the proletariat, and the middle class consumed, subdivided into 3 pennies, or 12 farthings, instead of a very awkward and unpractical $12\frac{1}{2}$ parts. A coined cent in our currency would be an incumbrance and hindrance.—Yours, &c.,

E. A. W. PHILLIPS, M.INST.C.E.

Hove.
January 12, 1917.

AN ALDERMAN'S RIGHTS.

IMPORTANT DECISION IN THE KING'S BENCH.

A Divisional Court of the King's Bench, consisting of the Lord Chief Justice and Justices Ridley and Lush, was on Monday asked to decide whether or not a member of a municipal body is entitled to exercise his right to inspect and make copies of documents relating to matters of local administration with the view presumably of assisting a ratepayer in possible litigation with the municipal authority. The action was brought by Alderman Woodward, of the Hampstead Borough Council, and the matter arose out of a closing order made in respect of 83 Palmerston-road, owned by a Mr. Arlidge. Mr. Woodward had taken up the position that he might properly assist Mr. Arlidge. The question was, however, whether in so doing he had not so far identified himself with Mr. Arlidge's case as to make it undesirable that documents such as those referred to should be disclosed to him, the probability being that they would be used by and on behalf of Mr. Arlidge in his pending litigation with the council.

Mr. Macmorran, K.C., and Mr. Sydney G. Turner appeared for the borough council, and Mr. Clavell Salter, K.C., and Mr. Brooke-Little for Mr. Woodward.

The Lord Chief Justice, in giving judgment, said the question involved was only a question of fact. *Primâ facie*, Mr. Woodward had the common law right to the production of the documents. It was contended, however, that Mr. Woodward required to see the documents for the purpose of assisting Mr. Arlidge in litigation with the borough council. On the facts he had no hesitation in coming to the conclusion that Mr. Woodward's proceedings in the matter were not dictated solely by the public interest. In these circumstances the Court ought to refuse to exercise its discretion in favour of Mr. Woodward by ordering the council to produce the documents. The rule would be discharged. Justices Ridley and Lush agreed.

NOTES FROM IRELAND.

SPECIALLY CONTRIBUTED BY AN IRISH CORRESPONDENT

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Irish Notes," 24 Bride-lane, Fleet-street, E.C.]

Institution Meetings.

Municipal and county engineers in Ireland are at a great disadvantage as compared with their fellow engineers in England and Scotland, owing to the few opportunities afforded in the country for visiting works in progress and for discussing subjects dealing specially with municipal and county work. Some twenty years ago the meetings of the Irish branch of the Institution of Municipal and County Engineers were well attended both by English and Irish members, and very successful meetings were held at Dublin, Belfast, Cork, and Derry, but after the passing of the Local Government Act in 1899 a number of county surveyors retired, and others became so engrossed in work, owing to the increased duties thrown on them, that it was found difficult to induce members to prepare papers for discussion or to attend meetings. In recent years a change has occurred in the Irish secretaryship, and Mr. Sellars, town surveyor of Dundalk, the new secretary, seems to have done his best to promote meetings; but the meetings held have been sparsely attended, and it is evident that greater inducements must be offered to members, both in the way of opportunities for inspecting important works in progress and in the preparation of interesting papers, in order to obtain a good attendance at meetings.

* * * *

One great drawback to the holding of district meetings in Ireland is the long distances many members would have to travel to the town selected for a meeting and the feeling that it would not pay to travel a long distance for a one-day meeting. Not long ago two road congresses held in Dublin in successive years proved very popular, and were well attended both by Irish and English surveyors, as well as by county and district councillors and the general public, but these congresses, of course, only dealt with subjects particularly connected with the construction and maintenance of roads and the traffic conveyed over them. It is to be regretted that, after the second of these congresses, steps were not taken to hold an annual congress dealing not only with roads, but also with the many other technical subjects with which municipal and county engineers are concerned. If the Roads Congress Committee, which the writer believes is still in existence, the County Surveyors Association of Ireland, and the Irish District branch of the Institution of Municipal and County Engineers would co-operate and arrange for the holding of, say, a three-days' congress at some important centre in Ireland each year for the purpose of discussing matters relating to county and municipal work, and for visiting works of interest, it would undoubtedly prove very successful. Possibly the Institution of Civil Engineers of Ireland, and other engineering societies, might be induced to take part in the congress, and this would add still further to its success. A congress of this kind would have it in its power to help materially in the advancement and prosperity of the country.

* * * *

Apathetic Councils.

There is in parts of Ireland a great lack of initiative and a disposition on the part of the general public to let things alone in the matter of town improvements, water supply, sanitation, and so forth. The result is that municipal work in many of the smaller towns is in a very backward state, and some of the towns, instead of increasing in prosperity from year to year, show signs of further decay with a declining population. All these towns have their town surveyors, and the rural district councils have usually their own appointed engineer or surveyor, but owing to the apathy of many of these councils these men can do little to improve the condition of their towns and districts. The holding of a large congress annually, however, in central places in the country and the discussion of matters relating to road maintenance, water supply, sanitary work and cognate

subjects would attract attention, and the proceedings would no doubt be fully reported in the public Press. Local councillors and other visitors could also be invited to take part in the proceedings, and the result would be a desire on the part of many of those taking part in the congress, and reading the papers discussed, to try and advance some of the reforms and improved methods advocated in their own district.

* * * *

A Suggested Congress.

The present time is perhaps not suitable for holding a congress, but it seems an excellent time to discuss the practicability of holding such a congress annually, and of appointing a committee to go fully into the question, and if the scheme is found feasible to draw up a report and preliminary programme. There should be no difficulty in calling a meeting to consider the proposal if the president of the last road congress, the chairman and secretary of the Irish District of Municipal and County Engineers, and the secretary of the County Surveyors' Association of Ireland would take up the matter. If it should be decided to hold a congress on the lines suggested, it should be quite possible to arrange that a meeting of the Irish District of the Institution of Municipal and County Engineers should constitute the first day's proceedings. At this meeting the more technical papers dealing with the work of municipal and county engineers could be discussed, while at the congress proper on the succeeding days papers of a more general and popular character could be dealt with.

* * * *

The assembling in congress of a large number of Irish councillors and surveyors, as well as many members of the general public in Ireland, besides visitors from England and Scotland, for the purpose of discussing the best means of improving their highways, as well as their water supplies, the sanitary condition of their towns and villages, and similar subjects, would assuredly be followed by good results. Will someone start the project?

SCOTTISH NOTES.

We propose to commence next week the publication of a "Scottish Notes" column.

THE FLY NUISANCE IN SOUTH AFRICA.

By C. E. Hall,

Chief Sanitary Inspector to the Bulawayo Municipality.*

In dealing with this nuisance, while it is possible for the council, with the co-operation of the residents, greatly to minimise it, I submit that the total elimination of the nuisance in Bulawayo is impossible. This will readily be understood when it is remembered that there are within the municipal area 2,300 night-soil pails and numbers of receptacles conserving dry and liquid refuse. These are essential to a town not having a drainage system, but at the same time attract flies and provide a feeding ground for them.

The installation of a drainage system would do much to lessen sanitary conditions in this town.

The department experimented with borax as a substitute for quicklime when disinfecting refuse pails after they had been scavenged, and I carefully watched the results. The refuse produced on the premises under observation included refuse from a [illegible] fruit and vegetable stores, hotels, restaurants, and business premises, and consequently of such a character as to provide an ideal breeding and feeding ground for flies. It was found that the borax did not compare with chloride of lime for general efficiency, and it was discontinued, and the use of chloride of lime again instituted.

The reason for the failure of borax is that the department can only disinfect a refuse bin at the time it has been scavenged, and the borax acts only on the contents it comes in contact with, consequently the refuse that is again deposited is not affected. Had the occupiers of these premises sprinkled the refuse each time it was before being deposited, the result might have been different.

The use of chloride of lime has this advantage over borax—namely, that after application of the lime gas is liberated, which gas rises through the refuse deposited, thereby destroying flies and maggots in the refuse, and at the same time acts as a "maggot killer."

A native is now employed whose duty is to clean out the rear portion of closets behind the riser of the seat, and then to sprinkle the chloride of lime. The appointment of this native on this work has minimised the filth nuisance of that portion of the closet that is not seen by the occupier.

While not deprecating the use of disinfectants, I am of the opinion that the best method of fighting the fly nuisance is on the following lines:—

(*a*) The proper conserving of refuse in fly and rain proof receptacles.

(*b*) The frequent removal of refuse at least once in seven days.

(*c*) The paving of stables and the provision of fly and rain proof manure middens.

(*d*) The enforcing of the council's sanitary regulations, with a view to ensuring a high standard of cleanliness.

* Extract from annual report.

A WELSH SURVEYOR'S "SALARY."

FOURPENCE A DAY!

The Narberth, Carmarthenshire, Urban District Council considered at their last meeting the resignation by Mr. W. G. Mathias of the post of surveyor. On being asked for his reasons for tendering his resignation (the *Welshman* reports) Mr. Mathias replied that they were three in number—viz.: (1) That the council did not advance him the necessary money to pay wages. He had to run over the town to borrow money with which to pay the wages. (2) The salary he received for doing all the work pertaining to the office of surveyor amounted to only 4d. a day, and there was a good bit of work to be done. (3) There was more trouble in carrying out the work of dealing with 1½ miles of streets than in dealing with 101 miles of roads in the rural district.

The clerk asked if the surveyor would let them know how many hours he worked for the council during the year as surveyor?

The surveyor replied he did not have his books there and could not tell them. He asked for an increase of wages when he started work for the council, and he was promised definitely that when the Housing and Town Planning survey was completed the matter would be considered, but nothing had been done.

Mr. Eynon said the appointments of sanitary inspector and surveyor were not separate appointments.

Mr. Henry Lewis said the difficulty connected with Mr. W. G. Mathias' first reason for resigning could easily be got over by getting the necessary cheques signed at the end of each meeting.

The clerk agreed that that could be done, and Mr. Lewis' suggestion was adopted.

The chairman then asked the surveyor what he had to say with regard to the wages question.

The surveyor replied that the council could afford to give him something more, as there was a lot of work and worry connected with the office.

The surveyor was asked to withdraw while the council considered the salary question in private, and on his return the chairman said the council had instructed him to ask him (the surveyor) to allow the wage question to stand over until after the war, when it would be duly considered. The council would deal honourably with him, and would no doubt accede to his request.

The surveyor replied that everything had gone up in price. He would agree to carry on the work until the end of the financial year, and he asked to be allowed a month to consider what they had asked him to do.

Mr. T. Williams (to the surveyor): Say you will drop the wage question until after the war.

The surveyor replied that everything had gone up.

Mr. Eynon said that everything had gone up for the ratepayers too.

The surveyor's request to be allowed a month to consider the council's suggestion was acceded to.

An Idle Refuse Destructor.—At the last meeting of East Grinstead Urban District Council, the surveyor, Mr. W. E. Woollam, reported that, in consequence of his men being called up for military service, he had been reluctantly compelled temporarily to shut down the refuse destructor, but the collection of house and trade refuse would go on as usual. It was hoped that householders would reduce the quantities of refuse as much as possible, and utilise all they could on their own gardens, and burn as much as was consumable of the rest.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Birmingham T.C.—Consideration is being given to the question of providing additional accommodation for the treatment of tuberculosis.

Burnley T.C.—The Carnegie Trust have offered a grant of £15,000 towards a central public library, the building of which, it is suggested, should be deferred till after the war.

Derbyshire C.C.—The Bridges and Highways Committee have been authorised to carry out works at the Eckington depot, at a cost not exceeding £200.

Hawick T.C.—The town council are seeking for sanction to a loan for the extension of the Anderson Sanatorium.

Leeds T.C.—It is proposed to adapt Fairfield House, Armley, as a training home for mentally defective women.

Surrey C.C.—Consideration has been given to renewed representations of the Richmond Town Council as to the inadequate and dangerous condition of Richmond Bridge, but the county council have decided not to move further in the matter during the war.

HOUSING AND TOWN PLANNING.

Burry Port U.D.C.—The council are applying to the Government for a grant of 20 per cent towards the cost of a town-planning scheme.

Camberwell B.C.—In view of the retirement in April of Mr. J. E. Burkmer, manager of the borough council's housing estates, it has been agreed to place the management of the properties in future under the control of the borough treasurer. The repairs to properties will in future be under the control of the borough engineer, and executed through his department.

Carshalton U.D.C.—The Local Government Board have asked the council to supply details of the proposed housing scheme, which is estimated to cost £20,000.

Dumbarton T.C.—A committee has been appointed to prepare a housing scheme to be put into operation when the time is opportune.

Dundee T.C.—It was announced last week that a proposition on housing would be submitted to the town council at an early date.

Wrexham R.D.C.—The engineer reported that he had prepared estimates of several housing schemes which it is intended to carry out after the war. The estimates are as follows: To complete scheme No. 1 at Rhos by the erection of forty-three houses, streets, £12,600; scheme No. 2, 100 houses at Broughton £30,000; scheme No. 3, sixty houses at Cefn, £18,000; scheme No. 4, sixty houses at Rhos, £18,000; total, £78,600. The engineer was instructed to proceed with the preliminary work of preparing plans and detailed estimates with a view to the council being in a position to carry out the schemes after the conclusion of the war, and also to obtain particulars of suitable building sites in the selected areas.

MOTOR TRANSPORT.

Ashton-under-Lyne T.C. — The Tramways Committee have agreed to purchase an electric tower wagon.

Barking U.D.C.—A small covered motor car is to be purchased for the use of the electricity department.

Bournemouth T.C.—The Local Government Board have refused to sanction at the present time an application by the town council for a loan of £1,200 for the purchase of a motor fire engine.

Clevedon U.D.C.—The council are considering the purchase of a motor fire engine.

Pontefract T.C.—The purchase of a 3-ton motor lorry is under consideration.

Sheffield T.C.—The corporation are recommended by the Health Committee to purchase five electric vehicles for refuse collection.

Surrey C.C.—The War Agricultural Committee have been authorised to purchase motor tractors and implements to let to farmers, at a cost not exceeding £2,000.

REFUSE COLLECTION AND DISPOSAL.

Bognor U.D.C.—It was reported that there were 475 houses not provided with proper dustbins, and the council decided to require the owners or occupiers to provide these within twenty-eight days from the service of the notice.

ROADS AND MATERIALS.

Ballymoney R.D.C.—It has been agreed to increase the Local Government Board statutory limit of road expenditure by £800 annually, and a proposition was also passed adopting direct labour in the rural district.

Barnstaple R.D.C.—The surveyor of highways, Mr. A. A. Richards, has been asked to report upon the coast road between Woolacombe and Mortehoe, which is said to be in danger of slipping into the sea.

Bideford R.D.C.—It has been agreed to pay contractors for manual labour, not included in their contracts, at the rate of 3s. per day (instead of 2s. 6d.), and for a man working with a horse 7s. per day. Some surprise was expressed at the receipt of a tender for road work from a man who had obtained conditional exemption under the Military Service Act as a farm bailiff. Another tender was accepted. In accepting the other tenders, regard was paid to the age and military classification of the contractors, as it was felt that would have some bearing upon their likelihood of being able to remain to carry out the work.

Cheriton U.D.C.—The council have referred to the Highways Committee a proposal by the Road Board, on behalf of the War Department, to widen Church-road West to 24 ft., constructing a pavement, fencing, and laying a sewer, at an estimated cost of £1,000, the board to carry out the scheme with their own labour. The Road Board, it was stated, would be prepared to consider an application for a loan for the council's contribution.

Chippenham T.C.—The borough surveyor, Mr. A. E. Adams, has been authorised to notify householders to remove snow from their forecourts, and to warn them that if they refused they would be reported to the town council.

Colchester T.C.—The Sub-Committee of the Roads and Drainage Committee reported that they had purchased a horse for £94.

Cornwall C.C.—The county surveyor, Mr. L. D. Thompson, has submitted an estimate of £59,811 for the financial year 1917-18. In this sum is included £800 for tar-spraying and grouting. It was reported that German prisoners would be available for quarrying and road work.

Falmouth T.C.—A letter has been received from the Local Government Board setting out amendments required in respect of the Swan Pool improvement scheme. The borough surveyor, Mr. H. E. Tresidder, stated that these amendments would cost about £2,000. It was agreed that inquiries should be made as to borrowing money to carry out the corporation scheme.

Gillingham (Kent) U.D.C.—Plans and estimates are being prepared of the proposed widening of Park-road, but it is not proposed to carry out the work till after the war.

Hailsham R.D.C.—An intimation has been received of the intention of the Road Board to contribute £720 towards the repair of the highways damaged by military traffic.

Surbiton U.D.C.—The council have been informed of the decision of the County Highways Committee to contribute one-third of the cost of carrying out an improvement in the Brighton main road where certain premises cause the footway to project into the carriageway.

Southmolton R.D.C.—It was reported by Mr. W. S. Gardner, one of the highway surveyors, that he

recently engaged two men whose rate of pay was not arranged. They had now sent in bills, and wanted to be paid 8s. 6d. a day. Both were good men. Suitable men could not be got for less in his district, because superior pay was obtainable for work in the woods. Mr. Jones: Farmers can't compete with 4s. 6d. a day. It was agreed to pay the bills.

SEWERAGE AND SEWAGE DISPOSAL.

Gillingham (Kent) U.D.C.—It has been decided to prepare plans and estimates for a sewerage scheme in Pier road which it is suggested could be put in hand after the war.

Holywell R.D.C.—The Holywell inspector has been instructed to present a report on the effect upon the rural district from a sanitary standpoint, of the stopping up of the flow of St. Winefride's Well. It was stated that eventually the stream down the valley would become dry and it was very important, in the interests of public health, that precautions should be taken.

Nuneaton T.C.—The town council are asking the Local Government Board for sanction to a loan for completing the conversion of the contact beds at Hartshill into filters. A proposal was also submitted to ask for sanction to a loan of £5,000 for the sewerage of the Coton-road district, but it was withdrawn with the explanation that Captain F. C. Cook (borough engineer) when home on furlough thought it would be best to postpone the work for various reasons.

Woking U.D.C.—Mr. G. Midgley Taylor submitted a report to the Drainage and Farm Committee on the Woking sewage disposal scheme. He enclosed a certificate for £521 in favour of Messrs. Hardy & Co., which left approximately 10 per cent retention on the value of works executed. The amount previously paid on the contract was £12,806. Mr. Taylor stated that no work authorised by the Ministry of Munitions was completed except the erection of the lime mixers, air compressor, sludge pumps, and new presses. The sludge pumps had been delivered, and the manufacture of the remaining machinery was well in hand. Messrs. Johnson, who had to erect the machinery, informed him that, even if all the machinery were delivered, there was little prospect of their being allowed to send an erector to Woking for some time.

WATER, GAS, AND ELECTRICITY.

Colchester T.C.—On the presentation of the Electricity Committee's report Alderman Barritt said the conditions under which current was now being generated and distributed were much more serious, and might become critical. He attributed this to the absence of the staff and remarked that they might have temporarily to suspend the supply of current. Mr. Wright suggested that the committee might send out a warning to the inhabitants to discontinue the use of high-voltage lamps, and use those of lower voltage.

Denby and Cumberworth U.D.C.—A scheme is being considered for the improvement of the water supply.

Hebburn U.D.C.—The deputy surveyor has received instructions to prepare an estimate of the cost of lighting the town by gas.

Louth T.C.—The improvement of the water supply has been referred to a sub-committee for consideration and report.

Newcastle (Co. Limerick) R.D.C.—The tender of the Newcastle West Electric Light Company has been accepted for the lighting of the town by electricity.

Newton Abbot U.D.C.—As the result of complaints about the restricted lighting the council have decided to light the main streets in the same way as the main streets of Torquay. It was stated that one lamp at Torquay gave as much light as twelve lamps at Newton Abbot, and that there was no economy in having the street lamps, as the current was being consumed just the same.

St. Andrews T.C.—Provost Aikman, reporting on the water of the Kennedy, said that Mr. James Watson Blackhall had stated that he had acquainted himself with many schemes in England, Scotland and Ireland, and he could truly say that St. Andrews had got the best water scheme (1,000,000 gallons) than any other he knew. The total expenditure for the water works at Cameron amounted to £43,371. The amount authorised to be borrowed was £41,050. It was agreed that the amount of the excess expenditure should be borrowed under the Burgh Police Acts, although this would entail repayment in a shorter period than if borrowed under the powers of the Provisional Orders.

Wellington R.D.C.—The council are asking for a Local Government Board inquiry into the question of the Hadley water supply. The cost of the supply has been guaranteed hitherto by a number of residents who now seek to be relieved of this responsibility.

Wolverhampton T.C.—It is proposed to effect an extension of the electricity main, at an estimated cost of £151.

MISCELLANEOUS.

Ashton-under-Lyne T.C.—A Bill will be prepared for the next Parliamentary session for the purchase of the Oldham, Ashton and Hyde Electric Tramway Company, and also to construct connecting tram lines.

Camberwell B.C.—Owing to the difficulty of obtaining grave-diggers, the Public Service Committee are engaging for the work excavators from the borough engineer's department at 9d. per hour. At the same time, it has been decided to pay the regular grave-diggers at the same rate, with time and a-half for all overtime worked, including Saturday afternoon.

Morpeth T.C.—Reference was made at the last meeting to the further erosion of the river banks at the entrance to the Castle Wood, and it was agreed that the borough surveyor, Mr. J. Davison, should inspect the banks and submit a detailed report as to the best means to prevent the further erosion, together with an estimate of the cost.

Portsmouth T.C.—A proposition for the enlargement of the town boundaries has been referred to the Finance Committee. The suggestion is to extend the boundaries as far as Purbrook on the north, Bedhampton on the east, and Portchester on the west, and develop on garden city lines.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATIONS FOR LOANS.

Boston T.C.—£1,000 for refuse-crushing plant.

Heywood T.C.—£3,335 for the Botany sewage works.

Nuneaton T.C.—£1,300 for a water-softening plant, and £1,200 for new distributing mains.

LOAN SANCTIONED.

Sheffield T.C.—£8,280 for new electricity plant.

FORTHCOMING INQUIRY.

23. **Stoke-on-Trent.** For the purchase of a motor fire engine and equipment (Mr. P. M. Crosthwaite) ... ...

Women and Road Work.—Smaller barrows and lighter brooms are to be provided by the Guildford Council for women scavengers.

"Safety First" Suggestions.—At the first meeting of the London "Safety First" Council, held on Monday at Caxton Hall, Westminster, consideration was given to the following, among other matters: A colour scheme for street lamps, and coloured lighting for street refuges and obstructions; the production of an effective luminous paint, and more effective whitening mixture for kerbs, &c.; the standardising of the rule of the road for both vehicles and pedestrians, so that both should keep to the left; the issue of a white armlet for use at night-time by pedestrians.

Control of Agricultural Machinery.—An agricultural machinery branch has been set up in conjunction with the Board of Agriculture and the Food Controller to deal with the control of the manufacture of agricultural machinery and implements. It is intended to class the manufacture of all such machinery and implements as munitions work. An advisory committee of representatives of the agricultural machinery trade, to advise the branch generally, has been established, and the following gentlemen have consented to serve: Messrs. A. Bornemann (Ruston, Proctor & Co., Limited, Lincoln), R. H. Fowler (J. Fowler & Co., Leeds); W. Harrison (Harrison, Macgregor & Co., Leigh); J. Howard (G. & F. Howard, Bedford); L. C. Ransome (Ransomes, Sims & Jefferies, Ipswich); J. Segar (R. Hornsby & Sons, Limited, Grantham); with representatives of the Ministry of Munitions, the Board of Agriculture, and the Food Controller.

PERSONAL.

Mr. J. W. Doughty, chief inspector of Lincoln waterworks, has been appointed to a similar position under the Doncaster Corporation.

Mr. Robert Grieves, engineer and surveyor to the Blyth Urban District Council, has resigned after twenty-three years' service. He intends to retire into private life.

Mr. J. B. L. Meek, city surveyor's department, Manchester, has been transferred from the class of associate member to that of member of the Institution of Civil Engineers.

Gunner R. H. Oxtoby, son of the borough engineer of Camberwell, Mr. W. Oxtoby, M.INST.C.E., has been awarded the D.C.M. for distinguished conduct in the field, and the borough council have conveyed their heartiest congratulations to father and son.

Lieutenant A. W. Edmett, Royal West Kents, assistant surveyor to the Slough Urban District Council, who was wounded in the first advance on the Somme, and is still an inmate of Guy's Hospital, is reported to be making very satisfactory progress.

Captain M. E. Fitzgerald, highway surveyor to the Warmley Rural District Council, has been warmly congratulated by the council upon having been mentioned in Sir Douglas Haig's dispatch. The officers of the urban council associated themselves with the resolution passed by the members.

Mr. Edward Whitwell, the new president of the Institution of Municipal Engineers, has been a member of that body since its inception, and during the past four years has been a vice-president. He is the author of several papers dealing with mechanical and civil engineering matters, and last year was awarded the president's prize of the institution for the best contribution during the year. Educated at public and private schools, and at the University College, Bristol, he supplemented his pupilage and training by serving as an assistant at Dalton-in-Furness, whence he became engineer to the Preesall Urban District Council. At that time he was the youngest official holding a chief appointment. After four years he was elected from 126 applicants to be chief engineer to the Kingswood (Bristol) Urban District Council, and two years later was the successful applicant for the position of engineer to the Abersychan Urban District Council, a post for which 137 other applicants applied, and a position which he has now held for nearly eight years. Among his many works mention should be made of the successful design of some of the most modern public buildings, including swimming baths; one of the latter is considered to be the finest in the southern counties, and in it, by special request, he gave a display of the art of natation on the occasion of the official opening. He is an ardent housing reformer, and has been responsible for the creation of some very extensive schemes, one of which he outlined on the occasion of the last annual meeting, and for which he has received, not only the eulogies of his authority, but of the municipal world in general—even the most sceptical must acknowledge the genius that produced a scheme which included allotments, open spaces, recreation grounds, gas, water, and baths for a weekly rent of 4s. 9d. to 5s. 6d., and which shows a profit of £250 on a year's working. Mr. Whitwell is also responsible for the design and erection of one of the earliest ferro-concrete road bridges in South Wales, and at the present moment is the responsible engineer for a very large county scheme, including the design and erection of three large span bridges and some miles of highway. Mr. Whitwell's forte lies in mechanical engineering. He has made a special study of internal combustion engines, and is responsible for more than one useful improvement and some patents. Only a short time before the war he prepared an excellent treatise on the "Possibilities of Mechanical Traction," a copy of which was supplied to the Local Government Board at their own request. As was to be expected, he offered his services to his country immediately at the outbreak of war, and it was not long before his abilities were recognised, and he was chosen to undertake a special duty. A portrait of Mr. Whitwell appears in the form of an inset to this issue.

OBITUARY.

Mr. James Harwood, who for many years previous to his retirement was borough surveyor of Launceston, died last week, we regret to state.

County Road Surveyors' War Bonuses.—On Saturday last the Eastern Highways Committee of the Norfolk County Council had before them an application of the district road surveyors for a war bonus. The surveyors based their application on the increase in travelling expenses and the increased cost of living, and claimed that the effects of the war were more keenly felt by them than by any other officials in the service of the county council. They pointed out that out of their salaries they had to find the means of locomotion and bear the cost of office accommodation. Their salaries were £140 on appointment, and £180 maximum was reached in eight years. After deducting expenses the amount left was inadequate. The chairman said the county surveyor had ascertained what increases had been allowed in other counties, and it was found that in Herts a 20 per cent increase was allowed, the salaries there ranging from £120 to £180. In Kent, where they were £180, a war bonus of £15, with £10 extra for travelling expenses, was allowed. In the North Riding of Yorkshire, where the salaries were £160 and £170, a £22 increase towards expenses was granted. In the North Holland Division the salaries were £150, and the increases given were £20 for war bonus and £15 for expenses. The chairman said the Bills Committee had come to the conclusion that it would be reasonable to give £10 as a war bonus and £10 towards the increase in expenses. This proposal was unanimously adopted.

FOR OTHER ADVERTISEMENTS
See End of Paper.

WILLESDEN DISTRICT COUNCIL.
ANNUAL CONTRACTS.

The Willesden District Council are prepared to receive Tenders from persons willing to enter into Annual Contracts, commencing April 1st, 1917, to execute the following Works or to supply the following Materials—viz.:—

1. Masons' and Paviors' Works.
2. Supply of Artificial Slab Paving.
3. Supply of Tar Paving and execution of Tar-paving Works.
4. Supply of Gravel, Flints, Burnt Ballast, &c., for repair of roads, &c.
5. Supply of Broken Granite for repair of roads, &c.
6. Supply of Lime, Cement, Salt-glazed-ware Pipes, &c.
7. Supplies of Oils and Chandlery.
8. Supply of Coal and Coke.
9. Barging of Road Slop, &c., from Fermoy Wharf.
10. Supply of Horse Provender.
11. Supply of Ironmongery and Tools.
12. Supply of Timber.
13. Wood-paving Works.
14. Supply of Horses, Carts and Drivers, for cartage of various descriptions.

Specifications and Forms of Tender may be obtained upon receipt of 5s. for each Tender Form, on and after Monday, January 22nd, 1917, upon application to Mr. O. Claude Robson, M.INST.C.E., Engineer to the Council, Municipal Offices, Dyne-road, Kilburn, N.W. The deposit for Tender Form will be returned upon receipt of *bona-fide* Tender.

Tenders to be delivered to the undersigned not later than 4 p.m. on Tuesday, January 30th, 1917.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
STANLEY W. BALL,
Clerk of the Council.

Municipal Offices,
Dyne-road, Kilburn, N.W.
January 17, 1917. (3,250)

REMOVAL OF HOUSE AND STREET REFUSE.

The Battersea Borough Council invite Tenders for the Removal of House and Street Refuse from the 31st March, 1917.

Forms of Tender, containing full particulars, may be obtained at the Town Hall, and must be returned to me, sealed and endorsed "Tender for Removal of Refuse," by 3 p.m. on Wednesday, the 24th January.

W. MARCUS WILKINS,
Town Clerk.

Town Hall,
Lavender-hill, S.W.
January, 1917. (3,252)

SOME RECENT PUBLICATIONS.*

THE ARCHITECTS' AND SURVEYORS' DIARY FOR 1917. In cloth gilt, 4s. London: Messrs. Waterlow Bros. & Layton.

We have received a copy of "The Architects' and Surveyors' Diary for 1917," and find that, notwithstanding war conditions, it is still a well-made, serviceable volume, full of useful matter for the professions it appeals to. Sections dealing with the Building Act, with its numerous amendments and by-laws, the various professional societies and their councils, the county and municipal surveyors and engineers of the country, the Housing and Town Planning Act, Regulations of the London County Council, the Board of Agriculture, and the Ecclesiastical Commissioners, the professional newspapers, and an abundance of general information and tables are features which all help to make the present year's issue as complete as any of its thirty-five predecessors, and we can safely recommend it as a most useful desk companion.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

TEMPORARY SURVEYOR'S ASSISTANT.—January 23rd.—Corporation of Aylesbury.—Mr. W. Harold Taylor, borough engineer and surveyor, Town Hall, Aylesbury.

TEMPORARY ASSISTANT.—January 29th.—West Hartlepool Town Council. £120 per annum.—Mr. Nelson F Dennis borough engineer, Municipal Buildings, West Hartlepool.

TEMPORARY ASSISTANT.—January 29th.—Somerset County Council. £120, with £20 for motor cycle.—Mr. Gordon R. Folland, acting county surveyor, Wells, Somerset.

TEMPORARY SURVEYOR AND INSPECTOR.—February 6th.—Ruislip-Northwood Urban District Council. £200 a year.—Mr. Edmund R. Abbott, clerk, Council Offices, Oaklands Gate, Northwood, Middlesex.

ASSISTANT ENGINEERS.—March 31st.—Indian Public Works and State Railways Department. Not less than twenty-one and not more than twenty-four years of age on July 1st.—The Secretary, Public Works Department, India Office, London, S.W.

CLERICAL ASSISTANT.—Lambeth Borough Council.—Borough Engineer, Lambeth Town Hall, Brixton, London, S.W.

ENGINEER FOR SEA DEFENCE WORKS.—Sidmouth. Three guineas per week.—Mr. Samuel Hutton, surveyor, Public Hall, Exmouth.

DRAUGHTSMEN.—Two required for Government work.—B.O.T., Employment Exchange. Quote No. A 2 781.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

NOTTINGHAM.—January 22nd.—For pulling down [illegible] and houses, for the Corporation.—City Architect, Guildhall, Nottingham.

[illegible] (Morocco).—February 16th.—For building [illegible] at an estimated cost of £7,000 for the authorities [illegible] of the "Junta de Servicios Locales." Terms at the Morocco Section of the Ministry of State, Madrid.

Engineering: Iron and Steel.

HALIFAX.—January 22nd.—For the supply of an [illegible] to pay-roll system [illegible] recovery plant at the [illegible] for the corporation.—Mr. Percy [illegible] Town Hall, Halifax.

Mechanically Propelled Vehicles.

LONDON.—January 24th.—For the supply of one 5-ton steam tractor and four 6-ton trailers, for the Metropolitan Asylums Board.—The Clerk, Asylums Board Offices, Thames Embankment, London, E.C.

WIGAN.—For the supply of a combination motor vehicle to serve as ambulance and prison van, for the corporation.—The Chief Constable, Town Hall.

Roads.

DORSET.—January 24th.—For the supply of granite, basalt, limestone, and tar-macadam, for the county council.—Mr. E. H. Habgood, acting county surveyor, County Offices, Dorchester.

STRATFORD-ON-AVON.—January 27th.—For the supply of 2-in. and ½-in. tarred slag, 2-in. and ½-in. dry slag, 2-in. and ¼-in. granite, and 2-in., ½-in., and ¼-in. limestone, for the corporation.—Mr. F. W. Jones, borough surveyor, Town Hall.

SOUTH STONEHAM.—January 29th.—For the supply of British macadam, to be delivered at various railway stations, for the rural district council.—Mr. F. Heather, district surveyor, Chevin Side, Old Portswood, Southampton.

WARRINGTON.—January 29th.—For the supply of road and sanitary requirements, for the corporation.—Borough Surveyor, Town Hall.

MIDDLESBROUGH.—January 30th.—For the supply of broken and unbroken whinstone, limestone, and tarred slag and whinstone, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

OTLEY.—January 31st.—For the supply of setts, kerbs and flags, granite macadam, pitch and tar, slag dust, tar-macadam, limestone macadam, and brushes, for the urban district council.—Mr. O. Holmes, surveyor.

NESTON.—January 31st.—For the supply of broken stone, chippings, and tarred macadam, for the urban district council.—The surveyor, Town Hall, Neston, Cheshire.

STOKESLEY.—February 1st.—For the supply of broken and unbroken whinstone, tarred limestone, and tarred slag and whinstone, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

LARNE.—February 1st.—For the supply of broken whinstone, for the urban district council.—Mr. W. G. Younge, clerk, Town Hall.

CANTERBURY.—February 1st.—For the supply of broken granite, granite chippings, granite dust, granite channelling, granite kerbing, and stoneware sewer pipes, for the corporation.—Mr. A. C. Turley, city surveyor, Municipal Offices.

HERTS.—February 1st.—For the supply of refined tar (to comply with the terms of the Road Board Specification, No. 1), for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

BATH.—February 3rd—7th.—For the supply of black rock, granite, flint, or other approved road stone, black rock gravel, Portland cement, fine and coarse sea sand, and lubricating oils, for the corporation.—City Surveyor.

EAST RIDING.—February 5th.—For the supply of about 8,000 tons of stone for macadamising the main roads, for the county council.—The County Surveyor, Beverley.

LITTLE HULTON.—February 5th.—For the supply of broken granite, 4 by 5 granite setts, tar-macadam, granite, limestone and slag chippings, grit, kerbs, stoneware pipes and gullies, and steam road rolling, for the urban district council.—Mr. J. H. Heyes, clerk, Council Offices, Little Hulton, Bolton.

SUNBURY-ON-THAMES.—February 5th.—For the supply of about 10,000 gallons of refined tar, for the urban district council.—Mr. H. F. Coales, surveyor, Council Offices.

SUTTON-IN-ASHFIELD.—February 5th.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burg, surveyor.

RUGBY.—February 5th.—For supplying horses and carts for road repairs, watering streets, and scavenging, for the urban district council.—Mr. J. H. Sharpe, surveyor, Benn Buildings, Rugby.

LITTLEHAMPTON.—February 7th.—For the supply of distilled tar, for the urban district council.—Mr. W. A. Clegg, engineer and surveyor.

* All of the publications reviewed, or referred to as received, can be obtained from the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of post books.

EASINGWOLD.—February 7th.—For the supply of whinstone and slag, for the rural district council.—Mr. F. J. H. Robinson, clerk.

BEXHILL.—February 9th.—For the supply of distilled tar, Tarvia, or other compounds for use in tar-spraying, for the corporation.—Mr. T. E Rogers, town clerk, Town Hall, Bexhill.

UXBRIDGE.—February 9th.—For the supply of granite, tarred granite and slag, gravel, flints and hoggin, and haulage, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor, Corn Exchange, Uxbridge.

HERTS.—February 10th. — For surface tarring approximately 1,250,000 sq. yds. of main roads with refined tar, for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

CORNWALL.—February 10th.—For the hire of steam rollers, not exceeding ten, for a period of one year, for the county council.—Mr. L. D. Thompson, county surveyor, County Hall, Truro.

HERTS.—February 12th. — For the hire of steam and petrol rollers, for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

Sanitary.

SEDGEFIELD.—January 26th. — For scavenging various districts, for the rural district council.—Mr. J. W. Tweddle, inspector of nuisances, The Avenue, Coxhoe, Durham.

WEST BROMWICH.—January 26th.—For the removal of nightsoil and emptying cesspools, for the corporation.—Inspector of Nuisances, Sanitary Offices, High-street, West Bromwich.

BRADFORD.—January 31st.—For the supply of 20,000 cotton double filter press cloths, for the corporation.—Mr. F. Stevens, town clerk, Town Hall.

ROWLEY REGIS.—February 6th.—For emptying and removing house refuse, for the urban district council.—Mr. D. Wright, clerk, Council Offices, Old Hill, Staffs.

Stores.

BATTERSEA.—January 24th.—For the supply of veterinary attendance, horse hire, materials for cart and van covers, harness material and fittings, paints, special paints, enamels, painters' sundries, varnish, tools, ironmongery, granite, macadam and chippings, tar-macadam, tar paving, York paving, Thames ballast and sand, stoneware pipes, timber for carpenters and joiners' work, timber for wheelwrights' work, bricks, cement, lime, slates, iron castings (side entrance covers, iron bars for blacksmiths' work, removal of house and street refuse and manure from the council's stables, disinfectants, coal and coke, and soaps and oils, for the borough council.—Mr. W. Marcus Wilkins, town clerk, Town Hall, Battersea, London, S.W.

CHELSEA.—January 24th.—For the supply of various articles and works, for the borough council.—The Town Clerk, or Mr. T. W. E. Higgens, borough surveyor.

MERTON.—January 26th.—For the supply of horse hire, flints and gravel, tar paving, Portland cement, stoneware pipes, brooms, tools, sewerage ironwork, broken granite, cartage of road materials, tar, grit, tar-macadam, and the surface tarring of roads, for the urban district council.—Mr. C. J. Mountfield, clerk, Council Offices, Kingston-road, Merton.

BISHOP AUCKLAND.—January 27th.—For the supply of sanitary pipes, manhole and lamphole covers, gully grates and frames, channel boxes, cement, spades, picks, brooms, brushes, whinstone, slag, flags, kerbs, setts, disinfectants, iron pipes, valves, and hydrants for the urban district council.—The Surveyor, Town Hall Buildings, Bishop Auckland.

OXLEY.—January 31st.—For the supply of setts, kerbs, flags, granite macadam, pitch and tar, slag dust, tar-macadam, limestone macadam, and brushes, for the urban district council.—Mr. O. Holmes, surveyor.

MIDDLESBROUGH.—February 1st.—For the supply of annealed scoriæ (broken), bricks, castings, concrete flags and kerbs, Portland cement, pitch and tar, sanitary pipes, gullies, junctions, slag (broken), coal (for domestic use only), coke, timber, whinstone and granite (broken), whinstone and granite setts and kerbs, brushes, bolts and nuts, disinfectants, electric lamps, general stores, glass, hardware, india rubber goods, iron and steel, leather belting, oils, paints and varnishes, packings, picks, shovels and shafts, polishes and cleansing materials, and ropes, for the corporation.—Mr. Preston Kitchen, town clerk, Municipal Buildings.

GILLINGHAM (Kent).—February 2nd.—For the supply of road materials, Portland cement and lime, requisites for precipitation works, sewer ironwork, bricks, oils, general stores and ironmongery, and disinfectants, for the town council.—Mr. J. L. Redfern, borough engineer and surveyor, Corporation Offices, Gillingham, Kent.

SWANSEA.—February 2nd.—For the supply of gullies, lamp pillars, lanterns, paving, kerbing, channelling and pitching, disinfectants, broken syenite, broken limestone, chippings, gravel, tar-macadam, refined tar, manhole covers, ventilating gratings, charcoal baskets, and step irons, for the corporation.—Borough Surveyor, Guildhall, Swansea.

GRIMSBY.—February 2nd.—For the supply of whinstone macadam, slag, artificial flags, Yorkshire flags, Yorkshire kerbs, granite setts, granite kerbs and channel, pitch, coal-gas tar, Buxton quicklime, blue lias lime, dog-kennel lime, Portland cement, drainage pipes, miscellaneous brushes, scavenging brushes, drysalteries, lubricating oils, oils, paints, bottles and corks, carbolised oil, disinfectant fluid, disinfectant powder, Formalin, and Formalin tablets, for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor, Municipal Buildings, 170 Victoria-street, Grimsby.

ACTON.—February 3rd.—For the supply of road and sanitary requirements, and hire of steam roller, for the urban district council.—Mr. W. Hodson, clerk, Council Offices, Acton, London, W.

SALISBURY.—February 9th.—For the supply of brushes, refined tar, oils, and disinfectants, for the corporation.—City Engineer and Surveyor, Endless-street, Salisbury.

Miscellaneous.

BANBRIDGE.—February 3rd.—For the public lighting of the urban district with gas or electricity, for the urban district council.—The Surveyor, Municipal Offices, Banbridge.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

25.—Concrete Institute: Mr. C. R. Peers on "The Care of Ancient Monuments."

FEBRUARY.

9.—Town Planning Institute: Prof. S. D. Adshead on "Monumental Memorials and Town Planning." 6 p.m.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* **Accepted.** † **Recommended for acceptance.**

CAMBERWELL.—For slop and refuse barging, for the borough council:—

	Per ton. s. d.
C. Burley, Limited	6 7½
W. R. Cunis, Limited	5 11
Flower & Everett, Limited	5 9

ROMFORD.—Accepted for the supply of broken granite, for the rural district council:—
W. Griffiths & Co., Limited, Bishopsgate, E.C., £966

APPOINTMENTS OPEN.

EXPERIENCED CLERICAL ASSISTANT wanted for the period of the War. Must be ineligible for military service. Knowledge of prime costs essential; shorthand and typewriting desirable. Apply, stating age, qualifications, experience, and salary required, to Borough Engineer, Lambeth Town Hall, Brixton, London, S.W. (3,248)

WANTED, immediately, a Resident Engineer for Sea Defence Work at Sidmouth. The appointment will be for 6 to 9 months.

Preference will be given to candidates with experience in heavy sea defence works, and the salary offered is 3 guineas per week.

Applications, with three copies of testimonials, should be sent at once to the Engineer, Mr. Samuel Hutton, Public Hall, Exmouth. (3,241)

RUISLIP-NORTHWOOD URBAN DISTRICT COUNCIL.

TEMPORARY APPOINTMENT OF SURVEYOR AND INSPECTOR OF NUISANCES.

The above Council require the temporary services of an Assistant Surveyor and Inspector of Nuisances, at a salary of £200 per annum.

Applicants must be exempted or that they are asked to take the place of the official who may be called up for military service, must be ineligible for military service.

Candidates must be experienced in surveying, preparation of plans and estimates, road making, drainage, sewage treatment and sanitary matters, and be able to satisfy the requirements of the Local Government Board as an Inspector of Nuisances (the appointment of Inspector being subject to the approval of such Board). The Inspector's duties will include those under the Public Health Acts, the Orders of the Local Government Board, the By-laws of the Council, the Dairies, Cowsheds and Milkshops Orders, the Factory and Workshops Act, 1891, the Housing and Town Planning Acts, the duties of Inspector of Petroleum, &c.

The successful candidate will be required to devote his whole time to the service of the Council, to give satisfactory security in the sum of £300, and to reside within the district.

Canvassing, either directly or indirectly, will disqualify.

Selected candidates will have notice to attend on the day of election, and will be allowed third-class railway fare.

Applications, endorsed "Surveyor and Inspector," stating age, experience, and qualifications, with copies of not more than three recent testimonials, must be sent to me, the undersigned, not later than the 6th February, 1917.

EDMUND R. ABBOTT,
Clerk to the Council.

Council Offices,
Oaklands Gate,
Northwood (3,238)

COUNTY BOROUGH OF WEST HARTLEPOOL.

TEMPORARY ASSISTANT.

Wanted, Assistant Surveyor in the Borough Engineer's Department. The person appointed, who must be ineligible for military service, will be principally engaged upon work in connection with Town Planning. Salary at the rate of £120 per annum.

Applications and testimonials to be forwarded to the undersigned not later than the 29th instant.

NELSON F. DENNIS, M.INST.C.E.,
Borough Engineer.

Municipal Buildings,
January 15, 1917. (3,244)

SOMERSET COUNTY COUNCIL.

Wanted, Temporary Assistant in County Surveyor's Office. Must have a good knowledge of modern road and bridge construction, be an active motor cyclist, and ineligible for the Army. Salary £120 per annum, with allowance of £20 per annum for the upkeep of a motor cycle, which will be provided. Applications, giving age and full particulars of experience, must be delivered not later than first post Monday, the 29th January, 1917, to

GORDON R. FOLLAND,
Acting County Surveyor.

Wells, Somerset. (3,246)

TENDERS WANTED.

CORNWALL COUNTY COUNCIL.

HIRE OF STEAM ROLLERS.

Tenders are invited by the County Council for the Hire of Steam Rollers (not exceeding ten) for a period of one year from the 1st April, 1917.

The Steam Rollers are to be fully equipped 12½-ton engines of modern type, fitted with approved scarifiers, and will have to be provided and delivered when required at such places or places in the County as may be directed by the County Surveyor.

The Contractors shall provide efficient drivers, also oil, waste, tires and stores, and each engine must be accompanied by a living-van, capable of accommodating at least three men, and a water-cart fitted with pump.

Tenders must contain prices, both including and excluding fuel, and must state if the Rollers offered are simple or compound.

The engines, scarifiers, living-vans, water-carts, and all tackle to be entirely to the satisfaction of the County Surveyor.

The Contractors to keep and maintain the hired Steam Rollers and their appliances in proper and thorough working order during the whole period of hire.

The Contractors will be required to enter into a Contract with the County Council.

The County Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders to be forwarded to the undersigned not later than Saturday, 10th February, 1917, endorsed "Steam Rollers."

L. D. THOMPSON,
County Surveyor.

County Hall, Truro.
January 15, 1917. (3,249)

COUNTY BOROUGH OF SWANSEA.

TENDERS FOR STORES, STONE, &c.

The Council of the County Borough of Swansea invite Tenders for the undermentioned Stores, Stone, Ironwork, &c., during the year to end 31st March, 1918:—viz.:—

Gullies, Lamp Pillars, Lanterns, Paving, Kerbing, Channelling and Pitching, Disinfectants, Broken Syenite, Broken Limestone, Chippings, Gravel, Tarmacadam, Refined Tar, Manhole Covers, Ventilating Gratings, Charcoal Baskets, and Step Irons, as may be necessary.

Forms of Tender and further particulars may be obtained at the Office of the Borough Surveyor, Guildhall, Swansea.

Sealed Tenders, endorsed "Tender for ——," to be delivered at the Town Clerk's Office not later than 12 noon on Friday, the 2nd February, 1917.

The lowest or any Tender will not necessarily be accepted.

H. LANG COATH,
Town Clerk.

Guildhall, Swansea.
January 15, 1917. (3,245)

COUNTY COUNCIL OF MIDDLESEX.

TO QUARRY OWNERS, GRANITE MERCHANTS AND OTHERS.

Tenders are invited for the Supply of about 7,500 tons (more or less) of 2-in. and 1½-in. Hand-broken Basalt for road construction, and 500 tons (more or less) of ¾-in. Clean Chippings, to be delivered from the various Stations in Middlesex.

Particulars, with Specification and Form of Tender, may be obtained at my Offices after Monday, the 15th instant.

Tenders must be sent to the Clerk of the County Council, Middlesex Guildhall, Westminster, S.W., by 12 o'clock (noon) on Wednesday, the 7th February, 1917.

The lowest or any Tender will not necessarily be accepted.

H. T. WAKELAM,
County Engineer.

County Engineer's Office,
Middlesex Guildhall,
Westminster, S.W.
January 9, 1917. (3,237)

BOROUGH OF STRATFORD-UPON-AVON.

TENDERS FOR ROAD MACADAM for the Year Ending March 31st, 1918.

The Stratford-upon-Avon Town Council invite Tenders for the Supply of 2-in. and ½-in. Tarred Slag; 2-in. and ½-in. Dry Slag; 2-in., ½-in., and ¼-in. Granite; 2-in., ½ in., and ¼-in. Limestone, in accordance with Specification to be obtained, with Form of Tender, on application to the undersigned.

Tenders, with samples of the materials to be supplied, to be lodged with the Borough Surveyor, sealed and endorsed "Tender for Macadam," not later than Saturday, January 27th inst.

The Town Council does not bind itself to accept the lowest or any Tender.

F. W. JONES, A.M.I.C.E.,
Borough Surveyor.

Town Hall,
Stratford-upon-Avon.
January 4, 1917. (3,230)

The Surveyor

And Municipal and County Engineer.

Vol. LI. JANUARY 26, 1917. No. 1,306.

Municipal Engineering in 1916.

Our Special Annual Issue once more takes the form of a *résumé* of municipal engineering work during the twelve months preceding its publication. We have retained this form not only because of its convenience, but also because of the appreciation with which it has always been received. Once more the war dominates everything. Its effects upon municipal engineering are very direct because of the rigid economy that is being enforced and also because of the exceptionally heavy demands which military movements have made upon the roads of the country. As regards bridges, very few have been built during the year. Indeed, if we allow our survey to extend to the Continent of Europe the record is one of destruction rather than construction. Our home bridges have generally been called upon to bear greatly increased weights, especially in the removal of heavy guns and munitions. Presumably, arrangements have been or will be made by the Government to secure their safety, or for the payment of compensation in case of damage. With regard to electricity supply, the war has, on the whole, had a stimulating effect. It is true that there have been difficulties, due principally to the high cost of materials, especially fuel and labour, and the difficulty of obtaining plant for extensions. But, as last year, there has been a further phenomenal growth in the power load. The most notable development has probably been in connection with the linking-up of neighbouring undertakings with a view to increased economy, reliability, and efficiency. It is to be hoped that the future will witness further efforts in the same direction. With reference to highway administration we have once more to record that the economy cry has led many highway authorities to reduce their expenditure to such an extent as to jeopardise the very existence of the roads for which they are responsible. War conditions have rendered it more necessary than ever that our home roads should be kept in a high state of efficiency. Not only are they called upon to bear a greatly increased burden of traffic, especially in munition centres and near camps, but at the same time the shortage of labour and materials renders it difficult, even with the best will in the world, to keep them in as good a state as they were when they had to suffer much less wear. It is obvious, therefore, that if the will be wanting, or if there be any disposition to starve this service, disaster must ensue. As we pointed out last year, war conditions have produced some astonishing results in regard to housing. Apart from the special case of the great munition centres, the Government have practically stopped all building. The result is that the scarcity of houses which undoubtedly existed before the war has become accentuated. That this is realised by the authorities is shown by the disposition to urge forward in every possible way the immediate preparation of housing schemes, with a view to their execution after peace is declared. The disposal of refuse has been considered again during the past year chiefly as a possible source of economy in municipal expenditure. No new destructor works have been erected, but efforts have been made, probably on a larger scale than ever before, to convert ordinary town refuse into useful commodities instead of destroying it by burning. More than one scheme for this purpose has been described in our columns, and all of them are referred to in the special article on the subject. We agree with our contributor that it is to be hoped that the efforts in the utilisation of waste products, which have been engendered by the special conditions caused by the war, will not be relaxed in peace time. As regards sewerage and sewage disposal, we were able last year to refer to the issue of the Final Report of the Royal Commission. This year there is nothing further to record in this direction, but again the work of the past twelve months has been directly affected by war conditions. It has been suggested, indeed, that the waste products in sewage may be utilised for the production of explosives. How far this is being or can be practically accomplished we are not in a position to state. Generally, it may be said that only work of the most urgent character, which in most cases has been paid for out of revenue, has been carried out during the past year. It may seem a little out of place to refer to street lighting as a branch of municipal work in these days. The problem which confronts the engineer to-day is not so much how to light the streets as how to keep them dark. Our contributor on this subject, therefore, devotes most of his article to a discussion of the methods of avoiding illumination. Town planning has during the past year been the subject of much good work. It is evident that in present conditions the actual execution of schemes is not to be expected. Interest in the subject has, however, been well maintained. Several important papers have been read, and at least two interesting competitions have been decided—namely, those at Dublin and York respectively. It only remains to mention two other subjects—namely, tramways and water supply. As regards the former, new construction has remained at a standstill, but the hands of tramway managers have been kept full in dealing with problems arising out of the shortage of staff and labour. Work in connection with water supply has also practically ceased for the present, first because of the necessity for economy, and, second, because of the shortage of labour, materials, and machinery. The difficulties of water engineers have been increased owing to the high cost of fuel. The maintenance of a full supply of pure water is of such obvious importance that there is perhaps less need in this connection than in some others to utter a warning against the dangers of false economy. If such a warning be needed, it was uttered with great weight by Mr

Brabner, who showed, in the paper which he read before the Royal Sanitary Institute, that no diminution in the quality or quantity of the water supply should be practised merely as a measure of economy. It is impossible to forecast what the future of municipal engineering work will be. As the war goes on the patriotism of municipal engineers becomes more and more evident. All who can be spared are serving in the field, while the older ones are cheerfully undertaking more onerous duties at home. Our conviction is that in the future, as in the past, the public interest will be the guiding motive in the work of every member of the profession.

BRIDGES.

Very few new bridges have been built during the past year, for, although it is now generally admitted that many of the existing road and railway bridges are stressed to their utmost safe limit, and that many new bridges are urgently required, the exigencies of the war are such that risks have to be taken, and the inconvenience and loss of time and money have to be borne with the best grace we can command.

A draft report has been prepared by the Joint Committee of the Concrete Institute, the Institution of Municipal and County Engineers, and the Institution of Municipal Engineers, which was appointed in 1911, under the chairmanship of Prof. H. Adams, M.Inst.C.E., to investigate the question of the loads to be provided for on highway bridges, but the report has not yet received its final form, and has not been published.

The great increase in the weight of the loads now carried on our roads, especially in the removal of heavy guns and munitions, or by the heavy motor wagons from our industrial towns, may make it necessary to revise this report before it is issued to the public. The War Office are bound to see that any future bridges are made sufficiently strong to meet all military requirements, and municipal engineers throughout the country will be glad to receive this report to assist them in designing their bridges to meet these new conditions.

The House of Lords have recently decided that the railway companies are not bound to maintain highway bridges strong enough to carry present-day traffic, but only need to keep them up to their original standard of construction. This is a serious matter for the county and other local authorities, for there can be little doubt that the traffic transferred from the railway to the road by rate is large, and that in many cases the cost of reconstruction or strengthening must come out of the pocket of the public instead of from the railway companies.

The Quebec Bridge Disaster.

The past year has been chiefly remarkable for an accident for the second time to the Quebec Bridge, and the agitation for the removal of Charing Cross Bridge and replacing it with a monumental road bridge.

On September 11th of last year the central span of the new bridge across the St. Lawrence, at Quebec, collapsed while being hoisted into position, and resulted in a loss of twenty lives. The central span was 640 ft. long, 88 ft. wide, 110 ft. high at the centre, and weighed over 5,000 tons. Unfortunately, this was the second time disaster had overtaken the bridge in recent years, for in 1907 the southern span fell, causing the loss of seventy-five lives. Though some doubts were felt about the strength as designed by the previous engineers, the recent accident does not appear to have been due to faulty design, but owing to a flaw in a casting of one of the bearers.

Charing Cross Bridge.

The proposal of the South Eastern Railway Company to expend £1,500,000 in strengthening and widening Charing Cross Bridge met with strong opposition from many quarters, and Parliament refused to sanction their Bill for this purpose. The opposition contended that it was necessary for the interests and safety of the public that the bridge should be strengthened. The opposition was led by Sir Aston Webb, R.A., and Mr. John Burns, M.P., and they were supported by many other well-known men. They strongly objected to the company's proposal to perpetuate this ugly bridge, which is admittedly an eyesore on the Thames, and they advocated replacing the existing steel railway bridge with a monumental road bridge and placing the station on the Surrey side of the Thames.

Mr. John Burns, in his forceful and picturesque language, described the bridge and station as an abomination which should never have been permitted, and said that both should disappear, so that "the Thames might be relieved of that ugly red oxide Behemoth that sprawls from north to south." He suggested a new station on the Surrey side, with a new vehicular bridge of the finest description connecting the north and Surrey sides, and that the London County Council, the two adjoining borough councils, and possibly the City Corporation, ought to co-operate in providing it.

Sir Aston Webb urged that the bridge and station were unworthy of their position, were very unsightly, and so poorly designed that the original station roof had fallen down, and the bridge now required strengthening. It is claimed that the land for a new station on the south side of the Thames can be acquired easily and cheaply, that a new road bridge with fine open spaces at each end would relieve the traffic on the other bridges, and would allow a great civic improvement to be made by laying out a boulevard similar to the Embankment on the north side. Municipal engineers will follow the development of these schemes with a lively interest, and it is to be hoped that the authorities responsible for these improvements will secure the assistance of an experienced municipal engineer when they decide upon the lay-out of the bridge and roads.

Destruction of Bridges in the War Area.

To turn to the war area, the past year has seen the destruction of a portion of the great Roumanian railway bridge of Cernavoda. This bridge, which was completed in 1896, cost 10,000,000 francs. It is nearly 11 miles long, and carries the railway between Bucharest and the port of Constanza on the Black Sea, and consists of two main bridges over the arms of the Danube and a series of viaducts and embankments crossing the marshes. This is the most important bridge destroyed in the war area during the past year, but it is only one of many. This destruction calls for a large amount of bridging work by the engineering sections of all the opposing armies, mostly of an emergency character. The bridges used by the Germans on the Danube are of the pontoon type, but on the Western Front the wooden-girder type is mostly used, though steel and concrete are also used. Temporary bridges of great length have been used, but 70 ft. is as great as it is practicable to push into position with the restricted resources of the field companies of engineers.

Miscellaneous.

A number of concrete bridges have been described and illustrated in our columns during 1916. One of the most interesting of these is the reinforced-concrete sewer aqueduct over the River Barwon and flats in Australia (January 28, 1916). The length of the aqueduct is 2,424 ft., and it is

designed on the cantilever system, with fourteen spans, thirteen of 176 ft. and one of 136 ft. centres. A footpath is constructed over the sewer, and a hand-rail serves as a girder 40 ft. long to bridge the gap between the cantilevers, which are 136 ft. from point to point.

Cranford Bridge, by Mr. H. T. Wakelam, M.INST.C.E., was described in our issue of May 12, 1916, and a very interesting set of illustrations and details of thirteen road bridges built in ferro-concrete to replace the bridges washed away in Norfolk in the disastrous floods of 1912 were given on June 2, 1916.

In May last the Longton Bridge, Cumberland, one of the finest concrete bridges in Great Britain, was officially opened. It is 625 ft. from end to end, and has three arch spans of 147 ft. 6 in. and 175 ft.

An interesting series of canal bridges is given in the March number of *Ferro-Concrete*, which shows how readily and economically, and with what variety of design this material can be used. The Canal Bridge at Burlington-street, Liverpool, designed by the city engineer of Liverpool, Mr. J. A. Brodie, M.INST.C.E., in ferro-concrete, shows with what artistic effect concrete can be used when designed with good taste and a proper use of architectural details.

The Arroyo Seco Viaduct, Pasadena, California, spans a picturesque valley, and is 1,470 ft. long, of which 800 ft. is on a curve and the remainder on a tangent. It has six spans of 113 ft. each, two of 151 ft. 6 in., one of 223 ft., and six arched girder spans and abutments at each end.

The highest arched-roadway viaduct in the United States is the high-level bridge recently constructed over the Cuyahago River Gorge near Akron, Ohio. It is 190 ft. from the bed of the stream to the level of the road, is 781 ft. long, and has a 24-ft. roadway and two 4-ft. footpaths. The five main arches are 127 ft. centre to centre of piers.

The Keadby Bridge over the Trent, 14 miles north of Gainsborough, recently completed by the Great Central Railway Company, claims the distinction of being the heaviest lifting bridge yet constructed in Europe. It is a combined railway and road bridge of five spans, the two fixed river spans being 135 ft. each, a lifting span of 160 ft., with a clear waterway of 150 ft., a track span of 40 ft., on which the lifting span rolls, and a 70-ft. approach span on the banks of the river. It is 53 ft. 6 in. wide, 29 ft. 3 in. railway, and 24 ft. 3 in. roadway. The weight of the lifting span is about 3,000 tons. It is worked by two 115-h.p. direct-current motors, and can be opened or closed in two minutes.

Among other interesting bridges which we have described are the Alexandra Bridge, Pietermaritzburg (July 14, 1916), and a series of ferro-concrete bridges in the Twrch Valley, Glamorganshire (October 27, 1916).

ELECTRICITY SUPPLY.

Like all other great undertakings, the business of electricity supply has been seriously affected by the strenuous conditions which have obtained during the second year of war. The high cost of materials—especially fuel—and labour, the difficulty or impossibility of obtaining plant for extensions or funds to pay for it, the restrictions on lighting, and the heavy demand for power, have all combined to impose a burden of anxiety upon the managers of electricity works and their committees or directors, and the loss of many of their skilled assistants and workmen, through the operation of the Military Service Act, in some instances has strained their endurance almost to the breaking point. Under these trying circumstances it redounds to the credit of the central-station engineers that they have courageously shouldered their tasks without complaint, and without sparing themselves, and with rare exceptions have succeeded in maintaining the supply of electricity without interruption, although in many cases their plant has been heavily overloaded and has had to cope with continuous demands for power by night as well as by day.

POWER SUPPLY.

As in the earlier stages of the war, the phenomenal growth of the power load has been a striking feature of the year. Never before have the advantages of a cheap and reliable source of motive power been so emphatically brought home to manufacturers, who, impelled by necessity, have eagerly turned to the public mains for the indispensable supply of energy. The inevitable consequence has followed that the demand has overtaken the available supply, and, where the manufacture of munitions of war or other national work has been in question, the supply undertakers have had to invoke the sanction and assistance of the Government in order to obtain additional plant and mains. In many instances new factories have been erected in the neighbourhood of comparatively small power stations, which, probably to the astonishment of their managers, have consequently become important undertakings equipped with three-phase turbo-generators and the most up-to-date accessories. We could cite several examples of such stations situated in places where a heavy power load would never have been dreamt of but for the war, and others in small industrial areas whose output has increased by leaps and bounds, completely transforming the prospects and potentialities of the undertakings.

But it is in certain cities already deeply engaged in the supply of motive power that the situation has presented the greatest difficulties, owing to the large size of the additional generating plant that has had to be provided and the short time in which it had to be put in operation. In some instances it has at times been found necessary to cut off the supply to the tramways, in order to maintain an adequate supply to the all-important factories; in others it has, unfortunately, been necessary to refuse a supply to prospective consumers of large blocks of power, thus compelling the latter either to obtain plant of their own, with the aid of the Government, or to choose some other locus where a supply of electrical energy could be got.

It is not in the public interest that details should be given regarding these places and incidents, but after the war there will be many disclosures of very great interest to all who are concerned with electricity supply. In one important town the engineer and his chairman were compelled to act in advance of their committee, and to put through enormous transactions at the shortest notice in order to cope with the demands that were made upon them, trusting to obtaining the approval of the committee at leisure after the event.

While it may be pointed out that the present heavy loads and outputs are recorded under war conditions, it cannot be doubted that the experience gained by new users of electrical energy, and the installation of motors and machinery on an enormous scale, will result in a permanent increase in the utilisation of electric power, and will confer immense benefits upon the business of electricity supply, as well as upon the industries which profit by this wholesome and drastic process of rejuvenation.

LINKING-UP ELECTRICITY WORKS.

The most notable development in connection with public electricity supply during the year has

been the movement towards the linking-up of neighbouring undertakings with a view to increased economy, reliability, and efficiency. The idea was not new; it received official approval when the Board of Trade, some years ago passed a Bill through Parliament authorising municipal supply undertakers in the Metropolitan area to connect their systems with one another, and, later, with those of supply companies. As the outcome of this Act many such connections were made, with gratifying results, and many more were contemplated when war broke out. We may add that great progress has been made in this direction since that date.

But in the provinces very little had been done by way of co-operation, and the view that supply should be given over large areas from very large generating stations was regarded rather as a remote ideal than as practical politics. For this condition the sub-division of the country into small municipal areas, each provided with its own isolated and self-contained plant and mains, was directly responsible. The large power supply companies, on the other hand, had always adopted the practice of concentrating their plant and linking-up their generating stations, a policy which attained its greatest and most successful development in the Tyneside district, where some sixteen stations, large and small, are connected to a common network of mains covering an enormous area.

The question was raised early in the year by the action of the Institution of Electrical Engineers, which discussed a paper by Mr. E. T. Williams on the reform of electricity supply in this country. The matter was vigorously taken up in Lancashire, where a large number of generating stations are situated in close proximity, and a powerful stimulus was given to the movement by the Board of Trade, which issued a circular letter urging supply authorities to co-operate with a view to economising fuel. The Incorporated Municipal Electrical Association, the Associated Power Companies, and the Institution of Electrical Engineers in June appointed two influential committees to promote the scheme, and with their aid local committees were formed in various centres to investigate the matter and formulate proposals in accordance with local conditions.

Good progress has already been made towards organising those areas in which suitable conditions obtain. Some opposition has been raised to the scheme on technical grounds, and the personal element is an important feature of the problem, as many engineers and managers in some cases are somewhat dubious as to their prospects under the proposed regime, seeing that the inevitable tendency would be towards the gradual conversion of the smaller installations into distributing stations, and the concentration of generating plant in large stations—a result highly desirable from the national point of view, but not necessarily attractive to the individual. The economies that would be realised, however, would so materially reduce the cost of supply that in all probability the output would in no long time be greatly increased and the positions of these engineers would be correspondingly improved, while the financial position of those undertakings would benefit with advantage to themselves.

As regards the technical objections, the fact that not only in other countries, but also in this country, the interconnection of generating stations has been carried out with great advantage disposes of their importance, and experiments actually carried out recently between two of the stations in South Lancashire gave very satisfactory results. The chief item of expenditure that will be necessary is the cost of the connecting cables, but the Treasury has promised financial assistance, and, moreover, the cost of the cables will be quickly recouped by the saving in fuel and labour, and the reduction in capital cost of generating plant.

FUEL ECONOMY.

Apart from the question of linking-up, the necessity of economising fuel has received a great deal of attention during the past year. The fact that the methods of generating electrical energy at present in vogue, although vastly improved in efficiency in comparison with the conditions of ten years ago, are greatly deficient in that they fail to utilise the fuel to the best advantage, has been universally recognised, and committees have been appointed by the British Association, the Government, and other bodies to take steps towards amendment in this respect. The fundamental fact is that by the direct combustion of coal under boilers the whole of the valuable by-products are wasted. The only remedy for this is to gasify the bulk of the coal, preferably at a low temperature, and to recover the by-products, burning the gas under the boilers. Not only would this practice achieve the desired object, it would also revolutionise the organisation of the boiler-house, and greatly simplify the control of the steam-raising plant. New problems would, however, have to be dealt with in connection with the gasifying plant, and it would be necessary not only to burn the gas obtained from the carbonising process, but also to gasify a large proportion of the resulting coke, and consume it in the same manner, as otherwise an immense quantity of coal would have to be handled, and the output of coke would be vastly in excess of the requirements of the market. On the other hand, the soft coke resulting from the carbonisation of coal at a moderate temperature, unlike the hard coke produced in gasworks, makes an excellent smokeless fuel for domestic purposes, and in time a large demand would spring up from this quarter, especially if the use of coal in open grates were restricted by Government action.

It will be seen that the problem presents many aspects, without touching upon the question of generating electrical energy at the coalfields, and similar projects. Changes must be tentative and gradual, but that changes will come at no distant date appears to be beyond question.

QUESTIONS OF MANAGEMENT.

The altered conditions have naturally affected the cost of production of electrical energy very materially, and the movement towards higher prices, which was in progress in 1915, has continued throughout the past year. The high cost of coal has especially affected the supply of energy for motive power, and the prices for the latter in many cases have been put up 25 per cent. The increase in the case of lighting supply, which depends to a less extent upon the cost of fuel, has been in the neighbourhood of 10 per cent as a rule, but in every case local conditions have played an important part in the matter, and wide variations are shown between different undertakings. The same applies to the gross and nett profits recorded, some towns having made larger profits than ever before, while others show a deficit on the year's working.

Among other benefits derived from the war has been the establishment of new industries in this country in which electrical energy plays an essential part, as in electro-chemical processes, refining steel in electric furnaces, and so on. There is a magnificent field for development in this class of industries, particularly where, as has been done in some cases, arrangements can be made to cut off the supply during the time of peak load on the generating plant. By this means it is possible to maintain the demand at an approximately constant value, an ideal condition which enables the engineer to produce electrical energy at minimum

cost. Another possible opening for electricity supply is slowly gaining appreciation—namely, for agricultural purposes. How useful electricity can be made on farms is better realised abroad than in this conservative country, but already, at Hereford, very substantial progress has been made, with gratifying results, and there is good reason to believe that equally good results can and will be obtained in other districts. At the Incorporated Municipal Electrical Association meeting in June a paper on this subject, read by Mr. W. T. A. Kerr, city electrical engineer of Hereford, on the uses of electricity in agriculture, together with the discussion which followed, was the outstanding feature of the gathering.

With the informal inauguration of a public supply of electricity by the borough council of Bethnal Green in June, that authority has at last carried a good intention into effect and has ended the reproach that it was the only Metropolitan borough in which electricity could not be purchased.

HIGHWAYS.

The past year has been one of great difficulty for surveyors in all parts of the country. Staffs have been so further depleted that it has only been possible to "carry on" by working at high pressure, and to a great extent it has been impossible to maintain the high standard of efficiency which existed in pre-war times. Many of our large towns have suffered enormously, as can be judged from a report recently made by the city engineer of Liverpool, Mr. J. A. Brodie, M.INST.C.E., in which he states that eighty-five of his staff have either been killed or died of wounds or sickness at the Front. Not only have losses been suffered for military purposes, but the lure of the high pay to be obtained in munition works throughout the country has attracted many of the best workmen on the surveyors' staffs.

The cry for "war economy" has led many councils to cut down road expenditure to an extent which in some cases has brought the roads to the destruction point. Even where money has been forthcoming, materials have been difficult to obtain, and in other cases where materials could be obtained it has been impossible to obtain the labour to use them on the roads. At a time when tar has been cheaper than for many years past, labour has been so scarce that few surveyors have been able to use it to the extent they have desired. Women have to some extent replaced men for the work of tar-painting, but the supply has not been equal to the demand. Coupled with the scarcity of labour, we have had an abnormally wet season, so that the difficulty experienced in keeping the roads even in a fair condition has become increasingly great. November, during which 9 in. of rain fell, was the wettest month for many years, and following a wet autumn many tar-painted roads have got into a deplorable condition.

NEGLECTED ROADS.

In addition to the trouble caused by the scarcity of labour and materials, and the weather, many roads have had to carry a greatly increased traffic, especially in munition centres, near camps, and at our large industrial towns and seaports. The greatly increased use of heavy motor wagons, consequent upon the commandeering of the railways by the Government, has shown the great need for better and stronger foundations than are found on most of our main roads, especially in the rural districts. Much good work had been done in this direction in the years just before the war, and it was only the improved condition of these roads that has enabled them to carry this increased traffic without showing serious signs of deterioration. This is in many cases merely living on capital, and, unless steps are taken to preserve a fairly high standard of maintenance, we must pay heavily in the near future for the repair of the damage due to our present neglect. That there is neglect, due in most cases to circumstances which neither the councils nor their surveyors can control, is beyond dispute, and it is difficult to see how we are to get our roads back to their pre-war condition unless the War Loan is followed by a Road Loan.

The Road Board's income has been largely appropriated for war purposes, and the sixth annual report of the board shows that application for only £310,261—of which £297,038 was for improvement of road crusts—was made during the year which ended on March 31st last. Compared with the previous year, this shows a decrease of £1,691,063, and of £2,283,544 compared with 1913-14. In February last year the Retrenchment Committee suggested that all grants for road improvements should be entirely suspended, and the board only sanctioned loans or grants for 1916-17 of £200,000, and that mainly for refined-tar treatment. The board have carried out a large amount of road making for the military authorities in the neighbourhood of camps, and they have also done similar work for the Admiralty and the Ministry of Munitions. The estimated cost of this work up to June 30th last is £1,809,621.

Forced economy has led surveyors to adopt many unusual shifts to maintain their roads in a decent, usable condition. Cheaper materials, especially for foundations, have been largely used. The success with the use of tarred clinker for foundations has caused it to be much used, and when surfaced with a harder material, such as Mexphalte, as at Hornsey and other places, it has been very successful. It has also been used for surfacing lightly trafficked streets more largely, though this can hardly be considered a novelty when we take into consideration the number of years Mr. F. Roberts has employed it at Worthing.

Further economy has been practised by many surveyors by cutting their old, worn wood blocks or stone setts, and this, with the high price of wood blocks and stone setts, represents a great saving. Though these methods are wise and necessary under present conditions, the question arises as to how far the use of a material like tarred clinker for surfacing roads can be justified in normal times. If there is a moderately heavy traffic a material that varies so greatly in its strength and consistency as clinker does cannot have a long life, and, as the quantity of tar required for a hungry material like clinker is much greater than that needed for tarred slag or granite, and labour for mixing will not be less than that required for the harder materials, the question of durability has to be carefully weighed against the cheapness of clinker. True economy can only be obtained by a careful consideration of all the local circumstances, and the experience of the surveyor and a good knowledge of local circumstances must be the main factors in arriving at a decision as to whether it is true economy or not to use cheap or more costly materials.

DESTRUCTION OF ROADS.

At the annual meeting of the Institution of Municipal and County Engineers held at Blackpool last year, two very interesting and practical papers on roads were read by Mr. Arnall, of the city engineer's department, Birmingham, and Mr. W. H. Schofield, county surveyor of Lancashire. Mr. Arnall's paper was a departure from the general run of road papers, and for that reason was the more valuable and interesting. While many papers have dealt with the constructive side of road making, very few have dealt with the

from the purely destructive side, as Mr. Arnall's paper on "The Destruction of a Macadam Road" does. It is very necessary that we should know the factors which make for the destruction of our roads if we are to be able to lay them with a reasoned confidence in their durability.

Attention was called to the great amount of interstitial wear which takes place in a road, and which is shown by the rounded condition of the stones found when a macadam road is picked up or scarified. The depth of the material at which the interstitial wear ceases will depend upon the weight of the loads and the character and width of the tyres. This internal attrition is found to be very much less in tar-macadam or bituminous roads, in which the tar or bitumen fills up the interstices better than is the case with ordinary macadam, and provides a resilient cushion which absorbs the surface shocks. The importance of using various sized stones so as to prevent voids, and the necessity for keeping water out of tar-macadam were also pointed out. Water is the great enemy of the tar-painted or tar-macadam road. Dampness, on the other hand, is good for ordinary macadam roads, but too much wet destroys all the cementing properties of the binding material, and this is especially the case with stone or binders having clay in their composition. Clay, being greasy, moves about under the weight of heavy traffic, and leads to a corrugated surface. Weak tar has somewhat the same effect, and wave action and corrugated surfaces are much more common in tar-macadam roads than in ordinary macadam.

POTHOLES.

Potholes are a source of annoyance to most surveyors, for they occur in nearly all roads. They are generally started by the action of horses' hoofs, coupled with weakness in the road due to unequal density of material or imperfect rolling. A road made of varying density, especially where the stone used is of small sizes, frequently goes into a series of potholes soon after it has been made. Though more often met with in macadam and tar-macadam roads, they are also to be found in wood paving and asphalted roads, due in the case of wood setts to soft or improperly seasoned blocks giving way, and in the case of asphalt to depressions caused by wave action or corrugation.

In Mr. Arnall's opinion it is the hammer-like action of wheels when they meet a depression in the road, which makes the wheels bump and jolt, that causes the potholes. The friction of rubber tyres on roads, he says, is enormous, causing the rubber to grip the stone and carry it along with it. The stones in front are pushed forward and outwards at the sides, until the axle comes over any one of them, then the movement is reversed, and the stones in the centre are gradually pulled back, and those at the sides inward; but the trouble is that they have all been displaced, and no stone is pulled back into its old place. They are merely disturbed, left loose, and the surface is disintegrated, the stone being "shaken out" rather than "sucked out" by the tyres. The remedy is constant attention and repairs to these holes as soon as they appear, and this can only be done by a consolidating material of a bituminous character.

The ease with which tar-macadam can be used to repair holes in ordinary macadam has led to its very general adoption, but care is required in doing this to see that the holes are well cleaned of small grit, are dry, and filled with fairly large material so as to avoid undue shrinkage or consolidation. Though this method is easy and effective for a time, it is not always successful or economical. The tar-macadam is of a denser character than the surrounding macadam, and in a short time the old material goes into holes, and the last state is very much worse than the first.

An interesting point brought out during the discussion on this paper was the great difference in the wearing value of stone in the form of setts and broken up as macadam. Mr. Gullan, of Belfast, said that a sett would last ten times as long as it would if broken up as macadam, and that sealing the voids with a bituminous binder gave a life of five times the life of ordinary macadam. That was because the stone was held up to its work. This view was endorsed by Mr. Arnall, who said there were granite-paved roads in Birmingham which had been down for fifty years. They were 6-in. setts, and had not worn half an inch. If it had been put on as broken stone they would have had to put on 3 in. to 4 in. every year and cart it off as mud. They would have had to put 10 ft. of stone on the road in that time in little bits, and scrape it off as mud.

IMPROVEMENTS OF HIGHWAYS.

The paper by Mr. Schofield on "Improvements of Highways to Meet Modern Traffic" was on somewhat different lines, but equally interesting. In calling attention to the great growth of the heavy mechanically propelled vehicles, he is able to speak with the weight of his large experience of the heavy Lancashire industrial traffic. Despite the Government's commandeering of all the heavy motor wagons that were being made when the war broke out, and many of those in actual use, or that have been built since, Mr. Schofield said that on many of his main roads the heavy motor vehicles are now 60 per cent more than they were before the war commenced. On the Manchester and Liverpool road the increase during the past five years had been sevenfold. The effect of this increased heavy motor traffic on the rural roads is disastrous, as they were never constructed to carry such heavy loads and at such high speeds as these vehicles travel at. It is found that most drivers take advantage of the clearer roads in the country, and the less risk of detection, to try and make up for the restricted speeds in the large towns by travelling above the regulation speed when they get on the country roads.

Some interesting figures were given by Mr. Schofield as to the cost of the reconstruction of these rural roads, so as to make them fit to carry present-day traffic. He estimates the cost of the hand-pitched rubble foundation, which is used on most of the main roads in Lancashire in the neighbourhood of large towns, with a 4-in. coat of tar-macadam and a 5-in. by 12-in. gritstone edging, at nearly £2,000,000 for the 350 miles of rural main roads. This payment, spread over ten years, would cost £686 per mile, apart from the cost of maintenance. Such a cost is prohibitive for most rural main roads, and the foundation is therefore dispensed with, and a 4-in. coat of tar-macadam is relied on at a cost of £3,200 per mile.

The millstone grit setts, which could formerly be relied on to carry the traffic, are now found quite inadequate to carry the heavy loads on the main roads between the docks at Liverpool and Manchester and the large number of industrial towns in South Lancashire. Even granite setts on concrete are badly spalled by the iron-shod wheels of these heavy vehicles, and it is necessary to bed the setts on a more resilient foundation than concrete, ashes or tarred chippings being generally used. The need for the use of rubber tyres instead of iron-shod wheels was generally admitted in the discussion which took place on this paper.

TAR MACADAM.

The question of the best material for tar-macadam again cropped up, with the usual division of opinion as to the merits of granite or slag. Mr. Schofield and Mr. Hadfield, of Sheffield, both preferred slag, while Mr. Finch, the county surveyor of Cumberland, and other speakers preferred granite. We dealt with this matter so

fully in our last Annual Issue that we must content ourselves with pointing out that the personal factor appears to be the chief cause of success or failure. Both materials have been laid with the greatest success in all parts of the country, and both have met with disastrous failures. To get the proper consistency of tar required in all situations is very difficult, and when got, unfortunately, it is not always used intelligently. Too much or too little tar, too damp or over-heated stone, may cause the best of stone and tar to be a failure. Good roads can be made with both materials by an experienced and careful man, though it does not follow that they will be suitable for the heaviest motor traffic. Granite or wood setts on a concrete foundation are still the best, and, on the whole, the most economical for our heaviest trafficked roads.

At a meeting of the Institution of Municipal and County Engineers held at Hull, Mr. Bricknell, the city engineer, stated "that the tractive effort required on a water-bound road is about half that on tar-macadam." This statement was questioned by several speakers who took part in the discussion on Mr. Bricknell's paper, Mr. Wakeford going so far as to ask, "Was that what Mr. Bricknell meant, or should the statement be reversed?" Most surveyors who have had any great experience with tar-macadam are aware that under certain conditions tar-macadam requires much greater tractive effort than ordinary macadam. It is, however, difficult to generalise without falling into error. The greater or less tractive effort required depends upon the quality and quantity of the tar used. If the tar contains too much of the lighter oils, or too much tar is used, it is bound to work up under heavy traffic or in a hot sun, and this necessitates greater tractive effort. There are, however, many slag and granite tar-macadam roads which have such a hard and clean surface, and are so free from any tar trouble, that the tractive effort is unquestionably less on them than on an ordinary macadam road. It has often been pointed out in these columns that it is difficult to get a standard tar fit for all situations, and the personal factor is nowhere more important than in the making of a tar-macadam road.

REPAIR OF ROADS IN HALF-WIDTHS.

Another matter of great practical importance which has been discussed in our columns during the past year is the question of repairing roads in half-widths. The discussion arose on a statement made by Mr. W. W. Gladwell, surveyor to the Norfolk County Council, who said "he had seen many examples of the work" (repairing roads in half-widths), "but had never seen a good one. He hoped he should never be asked to do it, as good results could not be obtained."

This opinion was challenged by a number of well-known surveyors, and, while everyone would prefer to repair the whole width of a road at once if it were possible to do so without causing inconvenience or danger to the public, most surveyors find that with ordinary care they are able to repair a macadam or tar-macadam road in half-widths which shows no signs of the joint, and develops no weakness where joined. Most surveyors leave the margin of the half-width in the centre of the road unrolled and bevelled off until they are ready to join up with the other half-width of the road, and with care do so with perfect success. Even if there are occasional failures due to want of care or inexperience, the public convenience and safety will not permit roads to be blocked for any length of time in these motoring days.

CONCRETE ROADS.

Concrete roads do not make much headway in this country, though their use in America is increasing at a surprising rate. Probably the war is largely responsible for this failure. In such a wet season as the past it ought to have been possible to make roads of this material with a greater chance of success than tar-macadam roads. Mr. Matthews Jones, who was one of the first road engineers to use this material for surfacing roads, said, in the discussion on Mr. Arnall's paper at Blackpool, that granite must be bound with some material that would keep it in position, and that cement was better than tar for this purpose. He said there were no potholes in the concrete roads he had constructed four years ago, but in reply to Mr. Wakelam he admitted that the traffic on these roads was very light—some 80 to 120 tons per day. This hardly affords a basis for judging the wearing capacity of concrete, for many tar-macadam roads carrying much heavier traffic have been down twice as long and still remain in good condition.

Mr. Chapman, whose experiments with concrete roads on the London to Dover road promised to be so useful to engineers, said the traffic on this road was 1,000 tons per twenty-four hours, and, as they could not close the road while the experiments were being made, the 1,000 tons was concentrated on the 10 ft. of road left open. As a result the concrete was badly damaged through the heavy traffic. "Tar-spraying, which Mr. Jones applied to his concrete roads, would not be very successful if he applied it to a road carrying any traffic," was Mr. Chapman's opinion. Tar serves the very useful purpose of keeping down the dust and filling up the ugly cracks found in so many concrete surfaces. An interesting statement made by Mr. Chapman was that rough-graded concrete (6 to 1) would not stand the compression of exceedingly heavy traffic, and was not a success, but a richer concrete (3 to 1) was as good as when it was first laid.

Of more than passing interest to road engineers is the proposal to construct a reinforced-concrete causeway, 20 miles long, to connect Ceylon to the Indian mainland, at a cost of £740,000. Of this 20 miles, 7 miles would be on the dry land of the sand banks or islands, and 13 miles in the sea, carried on reinforced-concrete piles. The piles would support concrete slabs as sheet-piling, which would be filled in with sand to provide a causeway 6 ft. above high-water mark.

ROAD SERVICE IN FRANCE.

The Government's appeal in November last for road engineers and roadmen to join a Road Battalion for Service in France, under Mr. H. P. Maybury as Brigadier-General, met with a splendid response so far as the engineers were concerned. Many engineers who had been hitherto barred from giving their services to their country, owing to being over military age, or through their councils refusing to let them enlist, gladly offered their services. Far more volunteers were found than it was possible to provide with commissions, and some disappointment and considerable inconvenience has been experienced by many men who had obtained the sanction of their councils to go to France, and then found that their services were not likely to be required. The ungenerous suggestion has been made in some quarters that it is owing to the Road Battalion being a non-combatant corps that so many have volunteered to serve in it. This is extremely unfair, for when we have universal service there must be a good reason why men, and especially young men, are not in the Army. It has been in many cases a cruel blow for a young fellow to find himself medically rejected, often on trifling grounds, or, what is even more galling still, to find his council or his chief refusing to let him go into the Army on the ground that they considered him indispensable. We are quite sure that the men who have joined this new battalion

and are to have charge of the construction and maintenance of the roads required for use by the British troops in France, are as patriotic and self-denying as those men who are already fighting in the trenches, and that their work will be as necessary and important as fighting. They will have to face the discomfort and hard work of campaigning, and they deserve the sympathy and good wishes of all who stay at home. We feel sure that they will not only do very useful work, but will add fresh honours to the profession of the municipal engineer.

HOUSING.

The housing problem has been very much under discussion during the past twelve months, owing to the conditions created by the erection of so many munition works in different parts of the country. Large additions have been made to the existing industrial populations of many of our towns, and in other cases large communities have had to be provided for on sites far removed from the old industrial areas. The Government, who have through the Ministry of Munitions practically stopped all building, except for munition works, and stopped nearly all loans for public works, have recognised the need and importance of housing schemes by sanctioning loans for the year 1915-16 of £554,328 for housing munition workers in various centres. This is practically half of the whole sum sanctioned for loans for all purposes. This sum is, however, quite inadequate to meet the needs even of the munition workers, and does not provide for the needs of the mining, woollen, boot, clothing, and other industries, which have been extremely busy producing goods which are as necessary for the proper carrying on of the war as the making of munitions.

The reason for the scarcity of houses is too well known to call for much comment. While recent legislation had for some years before the war been the most important factor in stopping speculative building, the greatly increased cost of labour and materials since, and the rise in the rate of interest, had practically given it its death-blow before the Minister of Munitions issued orders that no building costing over £500 was to be built without being sanctioned by his department.

Whether it would be possible to build cottages to-day at a profit, even if labour and materials were forthcoming, is very doubtful; but with labour and materials practically all commandeered for munition works and the accommodation of munition workers, it is very evident that the provision of cottages must either be carried out as a Government measure or by a company or community in receipt of a Government subsidy.

The need for cottages is felt throughout the country, though it is most pressing in munition and mining centres. In the South Wales coal-field it is said that 25,000 houses are wanted at once, and that 10,000 will be required after the war. At Swansea there are 1,000 persons with their names on the house-agents' books waiting for houses which are not likely to become vacant until after the war. At Woolwich, where the Office of Works have erected houses to accommodate 1,300 families on the Well Hall Estate, it has been found necessary to supplement this accommodation by building 2,000 huts, and providing hostels for women workers. The demand for houses in Carlisle, caused by the workers from Gretna, has forced up the rent for cottages from 3s. 6d. to 10s. per week. In Huddersfield, where Messrs. Dyer, Limited, have erected works to employ from 20,000 to 30,000 hands, it has been found necessary to house the latter in wooden huts. At Sheffield a Housing Committee has been appointed to deal with the housing question, and the Tinsley Committee have had to find accommodation in the adjoining towns and villages. In Barnet, Coventry, and many other places similar urgent need exists.

It is very evident that although these munition works are of a temporary character, many of them are likely to become permanent, and the question will have to be faced as to how they are to be dealt with in a satisfactory and economical manner. In Glasgow the city council have built a block of twenty-four single-roomed tenements in the Calton area, which they have furnished and let at 6s. per week to provide temporary shelter for married couples.

COTTAGE *v.* TENEMENT.

The superiority of the cottage over the tenement is now generally admitted in England, but it is still disputed in many influential quarters in Scotland. Sir John Lindsay, the town clerk of Glasgow, presiding at a housing conference, said he preferred the Scottish tenement to the English self-contained house, and, although he was told by a speaker who followed him that "if he preferred a tenement he should live in one," and another speaker said they "ought to thank the town clerk for his very interesting and *misleading* address," he still stuck to his guns, and a resolution in favour of cottages had to be withdrawn. Mr. Jas. Thomson, the city engineer of Dundee, said "London people did not know what a tenement was." On the other hand, Mr. Ross Young, the town planning engineer for the Middle Ward of Lanarkshire, who should know what a tenement is, considers the Scottish tenement "a national blunder," and says "the death-knell of the tenemental system should be pronounced as speedily as possible."

In England the tenement or block system is confined to London and a few of our larger towns, but few housing experts favour it if it is possible to erect cottages in the district economically. On expensive sites everyone recognises that cottages cannot be erected to let at an economic rent. It is only dear land which makes a builder erect these huge barracks, and we rarely find an English local authority adopting the tenement system in these days. The greater thickness of walls, the loss of floor space, the increased cost of labour as one gets higher, the inconvenience and loss of time to tenants, and the absence of privacy, offset the cost of a greater quantity of land and the increased road charges and cost of fencing which are necessary in the self-contained cottage or villa. Wherever land is fairly reasonable there is no excuse for tenements.

A STATE DUTY.

It is, however, necessary to recognise that private enterprise is not likely to provide a tithe of the cottages required for housing the workers of this country, and that the State must step in and build the cottages or assist the local authorities to build them by advancing money either free for a time or at a low rate of interest for a long period. Mr. Walter Long, M.P., before he left the Local Government Board, in meeting a deputation from the Housing and Town Planning Congress, agreed that the sum of £20,000,000, which the Government was asked to set aside for the provision of working-class houses, might not be sufficient to provide the decent homes which it was the duty of the nation to provide for our soldiers when they came home. It is estimated that 400,000 cottages are wanted immediately, and of this number 120,000 are wanted in the rural districts.

The question of cost is a very important factor, which will vary considerably according to the locality in which cottages are built. Thanks to Government assistance, the Irish cottager has a

comfortable and sanitary cottage provided for him at a rent of from 1s. 2d. to 1s. 4d. per week, and the buildings compare very favourably with any cottages provided by an English or Scottish authority. In these countries the rents vary from 3s. 6d. to 10s. per week, but the cottages are generally larger and better built than the Irish cottages, though the difference in cost does not represent a difference in value from the point of view of accommodation.

BY-LAWS REVISION.

Many demands have been made by architects and builders for a revision of the building by-laws so that cheaper cottages may be built. While many municipal engineers sympathise with the desire to cheapen building, the great majority feel that on sanitary and constructional grounds it is very difficult and somewhat dangerous to make any sweeping alterations in the by-laws relating to new streets and dwelling-houses.

At Sheffield a committee appointed to consider the revision of the by-laws have recommended a number of alterations and variations for the period of the war and for two years after, and that before the expiration of this period it should be considered whether the alterations made should become permanent. The main alterations which they recommend are to allow certain party walls under 30 ft. high to have a thickness at the lowest floor of 8½ in., instead of 13 in., and to reduce the thickness of the external walls of water-closets from 8½ in. to 4½ in., if the brickwork is built in cement. The sizes of the timber are to be left to the builder, subject to the sizes being satisfactory, presumably to the surveyor or building inspector. Skylights in attics are accepted as windows, instead of requiring a vertical dormer window. Windows in water-closets are unnecessary if sufficient light and ventilation can be obtained otherwise. The committee suggest that further economies can be made:—

(1) By omitting cellars and substituting pantries and coal-houses on or near the ground-floor level.

(2) By the use of reinforced-concrete walls.

(3) By making the height of the rooms on the first floor to be 7 ft. 6 in. at the eaves.

(4) By using asbestos slates for roofs, instead of slates.

The Local Government Board of Scotland are erecting in the Vale of Leven three-room-and-kitchen cottages in concrete, with external walls 3 in. thick, strengthened at intervals with 9-in. piers. Another experiment is the erection of concrete cottages with hollow walls, consisting of 2⅜-in. and 3-in. concrete slabs, with a 3-in. cavity. The slabs are rough-cast outside and plastered inside, and the cottages have slated roofs. Standardisation of doors, windows, and fittings, and building in sufficient numbers, must be adopted if cheap cottages are to be erected. Where slag heaps or gravel pits are plentiful, concrete cottages should be built cheaply, and where neither slag nor gravel can be obtained easily, there are many places where clinkers can be used with satisfactory results, both from a constructional and economic point of view.

SURVEYORS AS ARCHITECTS.

In the last of the interesting lectures on town planning, which he has recently delivered at University College, London, and which we reproduced in our issue of January 5th of this year, Prof. Adshead insists that housing will never await town planning, and that local authorities, without waiting for the promised Government grant, should prepare a comprehensive plan of their areas, so that they can find sites for cottages without completing a detailed town planning scheme. This is sound advice, and will doubtless be followed by the majority of the surveyors who are likely to have to prepare housing schemes. He proceeds, however, to have the usual architect's fling at the capacity of the surveyor and his staff who may be called upon to prepare such schemes. He says: "I presume that if permission were granted *the surveyor and his staff, who are certainly not qualified to undertake such work*, would at once set about and make the plans." He then proceeds to say that his own view is "that we want a standard cottage, or two dozen standard cottages, prepared by a Government department in conjunction with the big building trade manufacturers and builders, and with the best architectural advice, and adapted to garden city principles. *The local authorities, most of whom are quite incapable of preparing a design for a cottage*, should only be empowered to adopt these, and that should be a condition of the grant."

To deal with the last portion of the Professor's views (which have the true Teutonic autocratic and dogmatic ring) first, one wonders how he will fare at the hands of his brother architects, who are always ready to protest against anything in the shape of official design and standardisation as destroying originality, and incidentally depriving them of their fees. In our last Annual Issue we called attention to the heartburning caused in the architectural world by the Government doing the very thing which Prof. Adshead now advocates. The designs published by the Government in 1915 for rural cottages were met with a strong protest from the Society of Architects, and were stigmatised as "stockpot" designs in the architectural Press. The Government not only did not heed this protest, but administered a well-merited snub to the architects by telling them that most rural cottages were designed by land agents and surveyors, and they were not inclined to determine that none but architects are qualified to do this work.

To turn to the Professor's statement that the surveyor and his staff are not qualified to design a cottage, we consider that the many housing schemes which we have illustrated in our columns during the past year clearly disprove such a statement. It is true that they may not possess the artistic merit of the Georgian houses designed by Prof. Adshead for the Prince of Wales at Kennington, but a sense of fitness and a proper regard for economy would naturally prevent any municipal surveyor from adopting the style and materials which the Professor thought fit to employ for his distinguished client. One would hardly expect the average cottager to appreciate the Ionic pilasters, neo-Grec ornament, domed turret, and fountain and statuary, which rescue the Kennington buildings from the commonplace, every-day type of building they otherwise would have been. The style is one of "studied simplicity," but a simplicity which is certainly not economical, for, like a well-cut coat or a tailor-made gown, such simplicity costs more than far more gorgeous clothes or elaborate designs.

Circular-headed windows and geometrically curved window sashes, traceried verandahs, ornamental ironwork balconies and doorways, and classic porches and balustrades may be Prof. Adshead's ideas of what is suitable and fitting for a working-class dwelling, but the surveyor who was foolish enough to present such a design to his council would soon have to look out for another post.

Prof. Adshead is generally so fair and broad minded that we cannot help thinking he has suffered a temporary lapse from his usual genial manner. Surveyors are not constantly reminding him and other architects who wish to monopolise town planning that they would be better employed on their own special work of building than talking very large about such engineering works as roads and bridges. Municipal engineers recognise that

[illegible] architects who may know some [illegible] of these engineering problems, just as some surveyors can be trusted to design a housing scheme which will not offend the artistic proprieties, and can be relied on to prove convenient and economical.

MUNICIPAL BUILDINGS.

The [illegible] of the building trade have practically put an end to nearly all kinds of municipal building. Several important buildings have been completed during the past year, but very little new work was started, and that only of an urgent sanitary character, for housing, or for providing light or power for munition works.

Early in the year the need for men for erecting munition works caused the Ministry of Munitions to stop work on the new London County Hall. No patriotic citizen can object to the men being taken away, even from such an important building as this, if they are required for work of so much more pressing national importance as that of erecting munition works. Everything else must be subordinated to winning the war, and, though many people will regret the stoppage of this and other important buildings, such as the London Water Board offices, none will question the decision of the Minister of Munitions acting as he has done at such a time.

Hospitals probably come next in importance to, even if they do not rival, the munition works, for the proper treatment and housing of our sick and wounded soldiers must take precedence of any building which is merely concerned with the civic amenities or the sanitary needs of the stay-at-home public. The process of converting some of our finest mansions and largest hotels into hospitals has been continued, and the Duke of Westminster's palatial country seat, Eaton Hall, and the Star and Garter Hotel, Richmond, are among the latest buildings to be used as hospitals. The very fine town hall for the Wallasey Council, which was completed during the past autumn, has also been devoted to hospital purposes. At Brentford a war hospital of a temporary character to accommodate 1,200 beds has been erected. New infirmary buildings, erected at a cost of £18,000, were opened at Nuneaton last April, and a new infirmary, accommodating with staff 175 persons, was opened at Eye, Suffolk, in September last.

BATHS AND WASH-HOUSES.

Several baths have been completed and opened during the past year. Among these may be mentioned the reconstruction of the Royal Baths at Bath, which were opened by Field-Marshal Lord French in February last. These buildings include three deep baths, two being fitted for chairs, three [illegible] for special douches, six for massage, [illegible] and a plumbers room. The buildings are splendidly fitted up, and many new features have been introduced. The steps in the deep baths are of aluminium, the corridor, bath-rooms, and dressing-rooms are paved with black and white [illegible] tiles, and the walls are covered with [illegible]. The entrances have been modernised and the lighting improved, and as the fee has increased the number of persons requiring medicinal baths while it has eliminated foreign competition, the enterprise of the corporation will no doubt meet with the success it deserves.

Most English coast watering places have not been very busy during the war, largely owing to the closing of Continental resorts to English visitors and the disinclination to travel in such disturbed times, when most persons needing treatment naturally feel. It will be a very long time before the German and Austrian spas recover their popularity with the people of the Allied countries. One leading inland watering place, however, has taken splendid opportunity of bringing their bathing facilities and the medicinal qualities of their baths before the visiting public, and to the great credit of the majority they have not failed to make good use of their opportunity. Not only has Bath reconstructed her baths, but she has had prepared a splendid scheme for reconstructing the centre of the city, which if carried out will greatly increase the popularity of the town as a health resort.

Baths of a somewhat different character were opened last season at St. Annes-on-the-Sea. The fine open-air salt-water baths which the council have constructed on the shore have been immensely popular, and nearly £3,000 was taken in them during the past season. The bath, which is described and illustrated in our issue of July 7, 1916, is 240 ft. long and 120 ft. wide. It has proved at times none too large adequately to accommodate the large number of bathers using it. Greater dressing accommodation is to be provided in the near future, and other improvements are to be made. It has attracted a large number of visitors to St. Annes, and has given a fillip to the schemes of its neighbours to the north and south. After the war two much larger bathing pools are to be constructed at Blackpool, and Lytham proposes to construct one 350 ft. long and 120 ft. wide.

The new Portland Baths at Nottingham, which have been erected on the site of the old tram stables from plans by the city architect, Mr. A. Dale, have a swimming pond 100 ft. by 30 ft., sixteen private baths for men and seven for women. The diving stage is built on the model of that in use at the Royal Automobile Club in London, and the sixty-seven dressing-boxes are collapsible, so as to give more seating room at galas, or for adapting the bath for public meetings and entertainments in the winter.

Another interesting building opened this year is the public wash-house erected by the Edinburgh Corporation at McLeod-street, at a cost of £6,500. It is the sixth public wash-house erected by the corporation, and is said to be the last word in wash-house construction. It has a washing-hall 80 ft. long by 35 ft. wide, and there are forty washing-stalls, with room for sixty more. Several features introduced have a sociological as well as engineering interest. The entrance hall has a large waiting-hall for women, with space for perambulators, &c., and a crèche is provided where young children will be taken care of while their mothers are washing. Each washing-stall has a boiling-trough, washing and rinsing tub, and drip-table, and each group of stalls is provided with steam-driven hydro-extractors. Mr. Jas. Williamson, A.R.I.B.A., the city architect, prepared the plans and supervised the erection of the buildings.

The Bournemouth Corporation are going to make a bold bid for public favour after the war, as they have had plans approved by the Local Government Board for a new pavilion to cost £5,000, which they hope to build as soon as the war is ended.

SCHOOLS.

Very few schools have been built or completed during the past year, but among the largest is that of the Stockport Grammar School, which has been completed at a cost of £37,000.

PUBLIC ABATTOIRS.

"Public Abattoirs" was the title of a paper by Mr. H. A. Brown, engineer and surveyor of Weston-super-Mare, presented to the annual meeting of the Institution of Municipal and County Engineers at Blackpool. Mr. Brown in his paper compared British and Continental

practice much to the disparagement of the British authorities, and his eulogy of the German abattoirs called forth a sharp protest by a correspondent in our columns. We do not in this country make such a fetish of our stomachs as the Germans do, and it certainly strikes British engineers as being out of place to erect palatial buildings for pig-slaughtering. The beer-halls which are to be found in the German abattoirs do not appear to be likely to be adopted in this country in these days of public control, or commend themselves to the ordinary citizen as being conducive to humane and careful slaughtering. The plans, while having many good points, are open to serious criticism both on the grounds of sanitation and convenience, while in nearly all the Germans appear to pay little regard to economy.

The plans of the Weston-super-Mare abattoirs, which were illustrated in our last Annual Issue, show a great improvement on those for the German abattoirs, and Mr. Brown must be congratulated on having avoided the pitfalls so plentifully exhibited in the Continental plans, which are applied as a standard in a cast-iron manner for all sizes of buildings irrespective of their actual requirements.

MISCELLANEOUS.

In our columns of May 5, 1916, we illustrated the Hardinge Library at Delhi, which was opened in March last by the Viceroy of India. The buildings, which were designed by the city engineer, Mr. T. Salkield, M.INST.C.E., are of a pleasing character, and the avoidance of the fussy ornament which so many architects feel it necessary to employ enhances its charm. The style is a happy combination of Oriental and Classic architecture, and Mr. Salkield warmly deserved the congratulations offered him by the Viceroy at the opening of the building.

Much regret was felt at the destruction by fire of the Canadian Parliament House at Ottawa early in the year. These buildings, which were erected at a cost of £1,000,000 sterling, are to be reconstructed as far as possible on the same lines.

The proposal to hold a competition for the Federal Parliament House to be erected at Canberra for the Australian Government called forth a strong protest from the architects of this country and France. Eight prizes, ranging from £2,000 to £250, were offered, but it was pointed out to the Australian authorities that they could not expect to get the best schemes at such a time as this, when the ablest of the younger architects of all the Allied countries were fighting in the field, and the older men were busily engaged on war work. Though the Australian Government were disposed at first to override these objections, they ultimately agreed to postpone the competition until after the war.

REFUSE DISPOSAL.

The necessity which has arisen owing to the war of avoiding expenditure not absolutely essential, and at the same time doing everything possible to prevent waste, has had considerable influence upon the work of refuse disposal during the past year. No new destructor works have been erected, so far as we are aware, but in one case, described in our pages, where no provision was made in the original scheme for the complete utilisation of the waste heat from the furnaces, the question of installing a steam pump for raising the sewage is now under consideration. By this means the day flow of sewage will be pumped without cost for power, leaving the night sewage only to be raised by the existing oil engine.

This is, however, a comparatively small matter. Much greater advantages will probably be derived from the efforts which have been made in various directions to convert ordinary town's refuse into useful commodities instead of destroying it by burning or dumping. One method has been in use in a few places for some years, and that is the conversion of refuse into manure by means of the Patent Lightning Crusher. The adoption of this system is extending, and we understand it is giving satisfaction in all cases. A scheme for the reduction of the garbage of New York indicates the possibility of very favourable results, both financially and from the sanitary point of view. It is estimated that the nett operating profits will exceed £100,000 per annum. The chief by-product is grease, which is extracted by cooking the garbage in a closed steam-jacketed vessel called the reducer. A somewhat similar apparatus has been adopted in certain places in this country for dealing with the contents of swill-tubs, sometimes known as hog-wash. In these cases the saleable products include not only grease, but crushed bones and poultry food. We think that more will be heard of this method of recovering value from waste products after the war.

In a number of places local authorities have requested the householders to burn as much as possible of their refuse in their own kitchen grates, and this is undoubtedly desirable in view of the present scarcity of labour. On the other hand, it is evident from articles which have appeared in our columns that town's refuse can be utilised in various ways. For a number of years past the clinker from the refuse destructors at Ealing has been used in the manufacture of paving slabs for footpaths, and these have proved thoroughly durable. Elsewhere the utilisation of clinker has been carried still further. In an article which appeared in these pages on December 8th last, Mr. L. D. Lewis, engineer and surveyor to the Abertillery Urban District Council, referred to a thoroughfare in his district which is made up entirely of clinker products. The kerbing is formed of clinker concrete, the footpaths of clinker paving flags or tarred clinker, and the carriageway of clinker Mexphalte, no channel stones being required, as the Mexphalte is laid right up to the kerb.

The article in question deals with the use of clinker Mexphalte for the surfacing of roads, and it is interesting to note that this material was invented by that eminent municipal engineer Mr. E. J. Lovegrove, of Hornsey. The advantage gained by the use of this material, which has a bearing upon the subject of refuse disposal, is that it affords a definite and profitable use for refuse destructor clinker, as 80 to 85 per cent is used in the process. There are other advantages connected with the use of this material, but these relate more to the matter of road construction than refuse disposal. It may, however, be noted here that Mr. Lewis was particularly struck with the resilient properties of the clinker Mexphalte, and he believes that time will reveal that this type of road will be found to outlast other more costly methods of road construction adopted to withstand heavy traffic. Similarly good results have been obtained by the use of this material at Wolverhampton, as described in an article in these pages on October 13th last, where it is stated that Mexphalte is particularly suitable for use with destructor refuse, as it enables engineers to find an outlet for the disposal of their clinker, which is often a troublesome and expensive matter, and at the same time enables them to provide a road surface which meets the requirements of modern traffic.

An interesting article on the utilisation of house refuse, by Mr. Reginald Brown, M.INST.C.E., engineer and surveyor to the Southall Norwood Urban

District Council, was printed in our issue of October 27th last. After referring to the wastefulness of disposal by tipping and the use of clinker with Mexphalte for road surfacing, the author deals with the calorific value of refuse, and describes his invention for producing fuel from it. The refuse is reduced to a powder by crushing, the powder is impregnated with a binding material, which both increases the calorific value and also destroys all organic matter, and the impregnated powder is compressed into briquettes ready for use as fuel. A similar method of utilising ashbin and other refuse was described in detail by Mr. H. G. Cooke, engineer and surveyor to the Market Harborough Urban District Council, in our issue of December 1st last. The briquettes, which in this case are given the name of "coalesure," are estimated to evaporate from 3½ lb. to 5¼ lb. of water per pound of fuel, and to leave from 10½ to 16 per cent of incombustible residue according to the grade, and to cost from 1s. to 9s. per ton to manufacture. If they can they could be sold at from 6s. to 11s. per ton, they would provide a cheap form of fuel with some profit, to which must be added the cost for disposal of the refuse which would be incurred if it were not utilised for making briquettes.

Another source of revenue from refuse in at least one case was the conversion of fish refuse into manure. At Bradford, Yorks, this manure was sold at prices varying between £6 and £9 10s. per ton. At these prices some profit remained, but much better financial results are anticipated under normal conditions after the war.

In conclusion, reference must be made to the process for the utilisation of disused tins from refuse heaps, which is being exploited by the British De-Tinning Company. Prior to the war, a considerable quantity of disused tins was exported to Germany, and this trade has now been taken in hand by the above company, who have already entered into contracts with three large boroughs for the erection of works within their borders. The pure tin is extracted from the metal and the residue is used for the manufacture of small articles of general utility for which it is suitable.

From the foregoing notes it will be seen that there is much scope for the prevention of waste, even in connection with such an apparently unpromising material as house refuse, and it is to be hoped that the efforts in the utilisation of waste products which have been engendered by the special conditions caused by the war will not be relaxed in peace time.

SEWERAGE AND SEWAGE DISPOSAL.

Owing to the restrictions which have been placed upon the execution of all work which is not essential to the carrying on of the war, there is nothing of importance to record in connection with the construction of sewers, and for developments in connection with sewage disposal we have to rely chiefly on work done in the United States. It is true that a considerable amount of work has been carried out in connection with new camps and munition works, but no details of construction or of results obtained have been made public, and cannot therefore be discussed on the present occasion. We look forward to the time when this will be possible, as there should be much to be learnt, even if only how *not* to do things. We mention this point for the reason that, from a report which was published in the daily Press, it appears that the pollution of rivers by sewage is increasing in places, and it would seem that the standards for sewage effluents which were previously considered necessary have not been adhered to in some of the new works. It will be interesting to know in due course whether this has been due to defects in design or construction, or to bad management, or even to negligence. It will not surprise us if it is eventually found that the last-mentioned is the cause of the trouble in most cases.

The general tendency has always been to treat sewage disposal works with indifference and neglect until serious trouble arises and compels attention. Even when they are not left entirely to themselves it frequently is the case that the management is left to a totally inexperienced man. At the last annual meeting of the Association of Managers of Sewage Disposal Works it was stated that many members of the association had been appointed to take charge of sewage works under the Government. This is good so far as it goes, but in our view it suggests that many of the new works constructed for the Government were by inexperienced engineers. If the matter is considered of sufficient importance to call for comment except in the light of hindsight, there would have been better prospects of securing satisfactory results all round. We fear it will be a long time before Government officials and members of local authorities will learn that a modern sewage disposal works is entitled to a place of dignity and importance, requiring regular and careful attention on the part of a manager possessing a considerable amount of technical knowledge and practical experience.

SPECIAL CONDITIONS OWING TO THE WAR.

As may be imagined, the provision of systems of drainage, sewerage and sewage disposal works required for the accommodation of troops and munition workers all over the country has created many exceptional difficulties, and has involved the consideration of varying conditions of all kinds. The sites were not always selected with a view to the best means of dealing with the sewage. In some cases the available fall has been insufficient for gravitation and the sewage has had to be lifted. In others the fall has been more than sufficient. At the outset everything was sacrificed to speed, with the inevitable result that the cost of the work was increased enormously. Then again there was the impression that in many cases the accommodation would be of a temporary character, and it was assumed that drains and disposal works of a similar nature would be sufficient for the purpose. When the "temporary" accommodation had been in existence a few months, with every appearance of its being required for years, it was soon made obvious that "temporary" sanitation is impossible, except for troops engaged in actual field operations, and fresh works of a permanent character had to be provided.

Sufficient is known of this work to enable us to state that, while most of the sewage works have been designed on well-known principles of the ordinary kind, in some cases attempts have been made to apply the latest scientific knowledge available with a view to economy and with some measure of success. From the foregoing it will be seen that there have been great possibilities of acquiring new experience under varying conditions, and we hope that when peace comes this will be made public for the benefit of all those who are interested in this branch of engineering.

SANITATION FOR TROOPS ON ACTIVE SERVICE.

While the conditions of life in the trenches and immediately behind the firing-lines have been described by many war correspondents and other writers who have visited the various fronts, these reports have for obvious reasons contained no information as to the methods of sanitation in vogue in such places. Our readers are therefore

under an obligation to Mr. N. W. Hoskins for the interesting particulars given in his paper, which we printed in our issues of December 8th and 15th last. It will be seen that, in addition to the discomforts of exposure to all kinds of weather, the difficulty of obtaining regular cooked meals, and, of course, the danger to life from many sources, our gallant troops in and near the firing-line have to submit to many inconveniences and discomforts from the lack of proper sanitary arrangements. Everything that can be done under the circumstances is done to secure the best possible sanitary conditions, but at their best these are far removed from those to which the men were accustomed before they entered on military service.

UTILISATION OF SEWAGE.

The necessity of preventing waste, and thus securing the greatest possible economy under present conditions has had the effect of drawing increased attention to the utilisation of sewage. The difficulties of using sewage universally for agricultural purposes by means of broad irrigation are now generally recognised, and recent efforts have been devoted to the extraction of those of its constituents which have any value either for manurial or other purposes.

The importance of increasing our home-grown supply of food, involving the proposed conversion of a considerable acreage of grass land into arable land, has raised the problem of obtaining the necessary amount of manure or fertilisers, and this again has revived the question of utilising sewage sludge for the purpose. The matter was discussed in these columns recently, when it was pointed out that ordinary sewage sludge contains only small quantities of ingredients of real manurial value. In spite of this, there is a large number of places where the local farmers readily take the whole of the sludge produced at the sewage works in their districts, and in some cases they even pay for the privilege of doing so.

There still remain many places, and especially the larger towns, where it is impossible to dispose of the whole of the sludge in this manner. The small percentage of actual manurial value in ordinary sewage sludge renders its cost prohibitive when it has to be transported to any considerable distance. There are two ways in which this difficulty may be overcome. One of them is to add certain chemicals, and thus increase the manurial value to such an extent as to make it worth while to incur the cost of transport, and this has been done to a small extent for some time past, even before the war. The other method is to extract from the sludge those constituents which are valuable and leave the useless material behind. Until quite recently the cost of doing this caused the ultimate product to be too expensive for practical purposes, but the introduction of the activated-sludge process for the treatment of sewage has given rise to hopes that much better results can be obtained than could be anticipated from past experience. The investigations made both here and in the United States show that the sludge produced by the activated-sludge process contains twice as much nitrogen as that produced by the ordinary methods of sewage treatment. Further, its nature is such that it can be more easily dried and prepared for transport.

The whole matter is dealt with thoroughly in two special articles which appeared in our issue of November 24th last, and the only difficulty we foresee is that, owing to the fact that the activated-sludge process is in actual operation in only a few places in this country at present, very little can be done in this direction in time for the cultivation of crops this season. The existing stocks of ordinary sludge could, however, be used up now, and if the matter were taken up with energy at once, a large amount of much more valuable sludge could be prepared ready for next winter by adapting existing works to suit the requirements of the activated-sludge process. It is very desirable that agriculturalists should be made aware of the peculiar suitability of this form of sewage sludge as plant food. We understand that official tests have shown that it produces better crops than an equal amount of farmyard manure of the same strength in nitrogen, and we assume that this must be due to the fact that bacterial action is more advanced in the former than in the latter.

EXTRACTION OF FAT.

Another valuable material in sewage is fat, and its extraction would have the double advantage of producing some income and at the same time preventing the troubles which are frequently caused by its presence in the sludge and in the filters. Up to the present it has only proved profitable to extract fat in places such as Bradford and Oldham, where it is present in the sewage in large quantities owing to the discharge into the sewers of trade effluents from wool-scouring works. In the case of one sewage works constructed since the war began it has been found possible to remove considerable quantities of fat in such a state that it can be sold without further treatment at a good price. As the removal is done by the man in charge of the tanks as part of his regular duties, no extra expense is incurred, and the sums received for the fat are all profit. In this case the sewage reaches the tanks in a fresh state, and, further, the tank treatment is designed to maintain the liquid sewage in a fresh condition, and with this end in view the period of detention in the tanks is not allowed to exceed three to four hours' flow. As a result no scum is formed in the outlet compartment of the tank, where most of the fat collects on the surface and is easily skimmed off by hand. The fact that the sludge from these tanks after thorough digestion is easily dried to a spadeable condition is probably due to some extent to the removal of the fat, which is known to yield extremely slowly to bacterial action.

EXPLOSIVES FROM SEWAGE.

A further possibility of utilising the waste products in sewage was suggested by Dr. S. Rideal in a paper he read at the recent annual meeting of the Association of Managers of Sewage Disposal Works. It was suggested that our overseas supplies of nitrate for the manufacture of explosives might be augmented by extracting the nitrates present in sewage effluents. As it is only the very best effluents that contain nitrates in any quantity, it is evident that the idea is not applicable to all sewage works of the ordinary type. Here, again, however, it was shown that the very high percentage of nitrates in the effluents from the activated-sludge process might bring the proposal within the range of practical politics.

The proposal made by Dr. Rideal was simply that the effluents should be evaporated to dryness, when the nitrates would remain behind ready for use. It was pointed out in the course of the discussion on the paper that the problem was one of cost, and criticism was directed to some suggestions made by the author for evaporating the effluents by natural methods. Such criticism is of little use. What is needed is for engineers with experience of the most economical methods of evaporation to work out a few calculations and state the lowest possible cost of evaporating water in large quantities. There is no doubt as to the presence of nitrates in sewage effluents, or as to the fact that this material, which would be very useful either for explosives or as manure, is now being allowed to run to waste. It is only necessary to ascertain definitely what it would cost to recover it, and it would

[illegible] at once to see whether its recovery would justify the expense.

THE ACTIVATED-SLUDGE PROCESS.

Reference has already been made to the fact that for records of developments in connection with sewage disposal we have to rely on the published reports of work done in the United States. Some of those reports are of little practical value, as they merely describe the works which have been arranged for the purpose of experiment, and give no results, or at the most, a few figures obtained after only a few weeks of operation. It is, however, notable that the bulk of the investigations and research work now being conducted in America relates to the activated-sludge process, and those reports which describe investigations carried out for any considerable period are worthy of careful study. At the same time it must always be borne in mind that in very few cases is the sewage comparable in strength with the sewage in this country, where it varies from 20 to 30 gallons per head per day, while in America it is seldom less than 50 gallons, and often over 100 gallons, per head per day, dry-weather flow.

Although very few reports of the work which is being done in this country are published, it is known that the activated-sludge process is already in operation in about six places, and these are under regular observation. One of the most interesting developments mentioned in a note printed on another page is the introduction of pulsating valves, by means of which the air is delivered [illegible]. It is obvious that this must result in a great saving in the volume of air required. From a report which appeared in our issue of July 28th last, it will be seen that this method of treatment had then been in operation at Worcester, dealing with 800,000 gallons per day, for some months, and that the results were highly satisfactory. In fact, it has already been suggested that the large area of filters and irrigation land previously in use can be "scrapped," and that the ultimate saving to the ratepayers will be not less than £1,000 a year. We also find that in the last annual report of the London County Council upon the London main drainage it was stated that experiments were being undertaken with a view to ascertaining whether this system is applicable to the treatment of London sewage. There is no doubt that when the construction of new, and the enlargement of old, sewage disposal works is taken in hand after the war the activated-sludge process will be adopted in many places, especially as it can be so easily adapted to existing works.

ELECTROLYTIC SEWAGE DISPOSAL.

With the object of providing our readers with all the information available in connection with the different methods of sewage treatment which have been tried from time to time, we have on several occasions published reports upon the so-called "electrolytic" system of treatment. Some of these were distinctly favourable, but we have always doubted whether it would actually prove to be a practical and economical system. The question was, we think, definitely settled by the report of the city officials of New York, printed in these columns on August 18th last. The City Board of Consulting Engineers considered six different methods of dealing with the sewage in one district in the city area, and "dismissed the electro-chemical process because of cost and the uncertainty of results with stronger sewage." Anyone in need of further particulars would do well to refer to the article in question, which gives the conclusions of other reports as well.

STREET LIGHTING.

"Street lighting!" The subject is rather embarrassing, in view of the fact that the streets most certainly have *not* been lighted during the past year; "darkness made visible" would seem to be a more appropriate title for this article, for [illegible] of us who dwell in towns have learnt to realise how very dark the streets can be, with a darkness that may be felt. Unfortunately, the lack of illumination has been the cause of an abnormal number of casualties, due not only to wheeled traffic, but also to falls and other accidents, and it has been seriously questioned whether the gloom has not been responsible for more loss and damage than could have been effected by Zeppelin raids if the lighting had been maintained as usual. During the first ten months of 1916, in the Metropolitan Police District alone, there were 509 fatal accidents and 11,827 non-fatal accidents due to motor vehicles, and the total number of accidents of all kinds numbered some 47,000. Much loss must also have been sustained by the hindrance to traffic, especially during the winter months, when the streets are often dark by 4 p.m. On the other hand, a slight economy has been effected in the consumption of gas and electricity, but not to anything like the extent that might be supposed, for in many cases the street lamps are kept burning, though obscured, and moreover, people prefer to stay indoors, and thus increase the domestic consumption.

[illegible] METHODS OF "DARKENING."

It is to be regretted that the responsible authorities have as a rule neglected to seek the advice of lighting experts in carrying out the regulations, with the consequence that a great deal of quite unnecessary and unjustifiable waste has been incurred. Lamp lamps, for instance, have been boxed in, whereas they might have been replaced by glow lamps of small candle-power, and similarly incandescent gas burners have been kept in use, and a vast amount of experimental work has been carried out in order to find the best way of preventing the rays from escaping from the lanterns. The most successful device appears to be a circular metal plate suspended beneath the burner, which obviates the bright patch otherwise thrown round the base of the lamp-post. The lamp then becomes a mere twinkle, barely sufficient to indicate the position of the post, and thus prevent collision with it. Many of the lamps are totally extinguished, and in these cases the danger of collision is very real. The diversity of methods employed by authorities in adjacent areas has in itself been a source of annoyance, if not danger, to users of the streets, and should have been obviated by the issue of general instructions based upon expert advice at the start. Nothing is more troublesome to both drivers of vehicles and pedestrians than "patchiness" of lighting, which greatly reduces the efficiency of the eye.

GENERAL PROGRESS.

One beneficial outcome of the difficulties abovementioned has been the "Safety First" campaign inaugurated by the London General Omnibus Company, which has already had good results, and bids fair to exert a lasting influence upon traffic conditions and dangers. A Council has now been constituted, with representatives of all the public bodies mainly interested, and will shortly be in a position to do good work. Under the circumstances, no notable advance of a technical nature could be expected, and none has been recorded, but some progress has been made in substituting tungsten lamps for arc lamps and the adoption of "automatic" devices for control [illegible] gas lamps. It has been argued, with reason,

that where the street lamps are capable of being lighted and extinguished from a central point there is no justification for darkening the streets until Zeppelins are reported to be *en route* for the town concerned, but no advantage has apparently been taken of this possibility. It seems that we must await the end of the war for any return to normal conditions—and may it be soon!

TOWN PLANNING.

Despite the abnormal times in which we are living, and the difficulties that beset municipal reformers, much good work has been done by town planners during the past year.

How largely the work of town planning lies in the hands of municipal engineers is shown by a return compiled by Mr. J. W. Cockrill, borough engineer of Yarmouth, which shows that out of 150 town-planning schemes, covering 250,000 acres, 139 schemes were prepared by the officials of the local authorities. In only five cases had outside experts been called in, and in only six cases had competitions been held.

This statement has rather disturbed the complacency of those members of the architectural profession who are never tired of trumpeting their own merits and decrying those of the municipal engineer and surveyor as town planners. They are now driven to the conclusion that it is only in the town-planning competition that any skill can be seen, and that whenever a competition is held the municipal engineer has to take a back seat.

This argument does not appear to be very convincing when examined. It must be remembered that the vast majority of municipal engineers are precluded from taking any part in these competitions both by the nature of their agreements with their councils and by the fact that their time is fully occupied with their own schemes. They have neither the time, inclination, nor need to take part in such competitions. No busy engineer would improve his position with his council by going in for competition work to anything like the extent that is done by half a dozen architects who specialise on this subject. But even in the small number of competitions which have taken place the younger municipal engineers have no reason to be ashamed of the figures they have cut in them. Messrs. Bogle, of the Liverpool city engineer's staff, and Piercey, the deputy borough engineer of Warrington, have been successful in obtaining premiums in the Blackburn, Huddersfield, and York competitions. Their success clearly proves that, given the time and opportunity, they can compete successfully with the best of the architects. When a municipal engineer wins a premium the architectural Press write as if they think the assessor must have been dreaming, or the competitor has scored by a fluke, and they generally manage to damn him with faint praise.

The municipal engineer is too diffident with regard to his abilities and professional status, and he fails to grasp the fact that his undue modesty is a blunder by which other people profit. In this advertising age the professional man, like the business man, who hides his light under a bushel will be certainly overlooked. The architect does not suffer from any false modesty as to his ability and rights, and where he finds opposed to him a class disinclined to assert itself, he promptly rides roughshod over it. Municipal engineers must see that every encouragement is given to their younger members to study this important branch of their professional work by continuing and enlarging the scope of the competitions, which Mr. Cockrill did so much to bring about just before the war.

PAPERS.

Many valuable papers on town planning, which have been published in our pages during the past year, have been read before the Town Planning Institute and the Institution of Municipal and County Engineers, and the lectures by Prof. Adshead have done much to focus attention on this subject. Of these, perhaps the most interesting to our readers were the three papers read at the annual meeting of the Institution of Municipal and County Engineers at Blackpool.

"Civic Study in Civic Design" was the title of a short but interesting paper by Prof. Abercrombie, the head of the town planning department of the University of Liverpool. He insisted that we carried our national habit of embarking on great undertakings without adequate preparation into the domain of town planning, and that this want of study and preparation was costly and wanting in method. There is no doubt that we frequently take up great schemes in a very off-hand manner, and without the necessary data and study to enable us to produce an efficient and economical scheme. A more methodical study is desirable, and Prof. Abercrombie suggests that it is necessary to do this by three stages: (1) The civic survey; (2) a comprehensive town plan; (3) town-planning schemes for definite areas.

In the case of small towns no elaborate civic survey is needed, for the borough surveyor's local knowledge is generally sufficient, but in large boroughs or districts a civic survey is not only useful but necessary. In thickly populated districts such as South Lancashire and Birmingham the towns are so close together that it is, in Prof. Abercrombie's words, "impossible, or rather municipally immoral, for one town to plan for itself without consulting with its neighbours, and such parochial town planning would prove a fatal blunder." This view was strongly supported by Messrs. Brodie and Stilgoe, whose experience in Liverpool and Birmingham on the large town-planning schemes, for which they are responsible, convinces them that it is also necessary to plan for the districts adjoining our large cities.

In his very able paper on "Economic Town Planning," Mr. Ross Young advocated the preparation of a sweeping and comprehensive town plan dealing with an area embracing a number of towns within reasonable distance of each other. Some difference of opinion naturally exists as to what is meant by a "reasonable distance." One speaker, in the discussion of the paper, said Mr. Ross Young wanted to start his town plan at Edinburgh and finish at Greenock, and Mr. Young admitted that he would like to do so. He wanted a plan of the whole industrial area, for if confined to small areas it was site planning, not town planning.

Any satisfactory development of town planning must take into account the need for linking up districts in such areas as those named, and this can only be done by a specially constituted central authority, or in the case of smaller districts by the county councils. The improvement schemes so often projected by large boroughs are frequently rendered useless by the disinclination or inability of the smaller adjoining authorities to carry the improvements into or through their districts.

Mr. Young's paper was mainly an appeal for first taking into consideration the economic expansion of our industries. As was pointed out in the discussion on the paper by Mr. Harpur, we must first know what industries are coming to our towns before we can settle our plans. We want to know where the railways, canals, and docks are to be placed before we can plan the streets for an industrial town. Mr. Young holds that the details of town planning are better left to a later stage,

be pointed out that physical science has done much to divert our industries into entirely new channels. The cheapening of transport, and the introduction of new forms of power, such as oil, gas, and electricity, may divert many of our industries from the coalfields or waterways, where the majority of our industrial towns are now found. This must be carefully considered by the town planner at the present time in connection with the vast sums of money expended on munition works, and the size and importance of the buildings and plant, and the large populations found in many of these munition areas.

While the opinion was expressed by several influential speakers that we ought to proceed slowly with our town-planning schemes, this opinion was not shared by Messrs. Aldridge and Shawcross, who read a paper on "Obligatory Town Planning." These gentlemen wish to see all the districts in the country, rural as well as urban, obliged to make a town plan. They want the Local Government Board to compel every local authority to prepare a town plan, but the provisions should be few and simple. They would provide for fixing building lines, the direction and width of new roads, the number of buildings per acre, areas of sites for dwelling-houses, space about workshops, factories and tall buildings, open spaces, securing amenities, prevention of nuisances, and waiving of unnecessary by-laws.

COMPETITIONS.

Two interesting competitions have been decided during the past year at Dublin and York. The largest scheme was that for the re-planning of Dublin, for which a prize of £500 was offered by Lord Aberdeen some time back. This was won by Prof. Abercrombie and Messrs. S. A. and J. A. Kelly, of Liverpool, who submitted a very fine scheme. There were only eight schemes submitted, and the winning scheme proposed to demolish some of the worst slums in the heart of the city, and provide a number of new roads giving quick communication with the suburbs, so as to lay out an industrial garden city at Clontarf. A new civic centre was to be formed, and the tramways were to be removed from Sackville-street to a new traffic centre further west, while Sackville-street, with its imposing width and fine buildings, was to be converted into a monumental street similar to the Avenue de l'Opera, Paris. A very important feature of the winning scheme was the proposal to reclaim the flats in Dublin Bay and lay out the land for docks and industrial sites. Provision for linking up the railway stations, which are now inconvenient and disconnected, were also made. Dublin has been described as "a city of fine churches and squalid houses," and there can be no doubt that the damage done to the central part during the Sinn Fein rising makes the rebuilding of a large part of the city a matter of immediate necessity.

The York town-planning competition was promoted by the city council, and dealt with three areas in the city. Fifteen sets of plans were submitted, the first premium of £100 being awarded to Mr. R. Dann, the second of £50 to Mr. M. A. Piercey, and the third to Messrs. Burroughs and Stevens.

Outside competitions the chief schemes published during the past year have been the fine set of plans by Mr. R. Atkinson for re-building the central portion of Bath. If carried out they will do much to restore Bath to the position of premier inland health resort. Mr. Thomas Mawson's work for the re-planning of Athens has been interrupted by the war, and the events of the past few months appear to be likely to create a condition of things which will call for a much more extensive scheme of re-building than Mr. Mawson anticipated.

Several schemes for the relief of architectural distress have led to the preparation of civic surveys. Of these the more important are those prepared by the London Society and a group of Manchester architects. The scheme for a London development plan contains imaginative proposals for developing the Metropolitan area, and includes the arterial roads recommended by the London traffic branch of the Board of Trade, with suggested modifications.

The scheme adopted at Manchester deals chiefly with a civic survey of south-east Lancashire. The plans were exhibited in Manchester during October, and proved of great interest to a large number of persons. A meeting of the North-Western District of the Institution of Municipal and County Engineers were invited to inspect them, and while they came in for a good deal of admiration for their novelty and artistic character, they unfortunately showed the lack of practical requirements, which is so often associated with fine artistic qualities. A full description of the plans and an account of the discussion on them were given in our columns on October 27th last.

TRAMWAYS.

While new construction has, of course, remained at a standstill, tramway managers certainly cannot complain that they have not had plenty to occupy themselves with during the past year. The general shortage of staff and labour may fairly be put first as the item which has required the most anxious attention. In June compulsory service was extended to married unattested men of the age of [illegible] and a large number of men had to join the Colours, while others, temporarily exempted, are still being taken. In some cases assistance has been obtained from volunteer drivers and conductors who are not liable to military service, but these form but a trifling total compared with the system, of whom some 10,000 are now serving (including about 1,000 in company employment). The vast majority are conductors, but Glasgow and a few other undertakings have successfully trained about 200 in all as drivers, and so far, apparently, there has been no reason to regret this step, as the number of accidents has not increased on these systems.

We do not suggest that there are no drawbacks to the employment of women for work as conductors or drivers, undoubtedly there are, but on the whole the experiment has proved highly successful. Without their aid the tramway transport facilities would have been in many areas absolutely crippled. In this connection we may mention, with pride, that up to the beginning of August the number of tramway employees who had joined the Colours was no less than 27,814. As long ago as January last the Birmingham tramways had lost 75 per cent of their men, and Manchester was paying some £72,000 a year to the dependents of enlisted employees. In view of the importance of retaining a sufficient number of men to keep the cars running—many of the men being engaged in work that no woman could possibly do—pressure was brought to bear on the Reserve Occupations Committee, and in March a measure of exemption was granted under very strict conditions. By October forty-four tramways were certified.

OTHER EFFECTS DUE TO THE WAR.

Naturally the conditions arising out of the war have affected the tramway services at every turn. The shortage of staff has led to an increased use of trailers, which at first had been stubbornly and unreasonably opposed by the police, but which have fully demonstrated the wisdom of their adoption. Over 130 are in use in London, and

they are no longer restricted to the "rush" hours, but are permitted to run all day. Their number will shortly be increased to 150 on the London County Council tramways, and permission has also been granted to the Metropolitan Electric Tramways Company to use them. The lighting restrictions, applying not only to the street lamps, but also to those carried on the cars, have very seriously hampered the operation of the tramways everywhere; in many cases the average speed has had to be reduced, and, owing to the physical strain on the drivers, the services have been cut off after 10 p.m. or 10.30 p.m. Nevertheless, there has been a grave increase in the number of fatalities in the streets due to the lack of light.

In December an excellent movement was set on foot by Mr. H. E. Blain, operating manager of the London General Omnibus Company, and formerly of West Ham Corporation Tramways, in the form of a "Safety First" campaign, which appears likely to have valuable results. A "London Safety First Campaign Council" has just been formed to carry on educative work, and to instruct both the drivers of vehicles and the public generally in the Metropolitan area with a view to reducing street accidents to a minimum. The company early in the year had started a campaign of this kind of its own, which had reduced the number of accidents due to omnibuses by 25 per cent. The London borough councils, tramway authorities, and the police warmly responded to the proposal, the need for which may be gathered from the fact that in the first nine months of 1916 there were in London no fewer than 34,575 accidents, of which 577 were fatal.

Shortage of coal has at times interfered with electric tramway operation, notably at Birmingham, where also the lack of generating plant has necessitated the stoppage of the cars for some hours each day over long periods. The high cost of coal has also led to the increase of fares in many towns.

As regards working results, which necessarily have been affected by the war, local circumstances have had a controlling influence. In areas where there are many munition factories large profits have been made, while in others less favoured either a small profit or an actual deficit has been recorded. The heavy loss on the London County Council tramways can hardly be ascribed to the war, as it is becoming the normal condition of this huge and costly undertaking. With a capital of nearly £14,000,000 sterling, of which 9·7 millions is outstanding, a total length of 150 street miles, and a revenue of nearly 2·34 millions, there was a deficit of £73,795 to meet from the general reserve fund, which now stands at less than this figure. It should in fairness be mentioned that the tramway strike caused a loss estimated at £100,000.

MISCELLANEOUS ITEMS.

In October the Devonport tramways, which were purchased by the Plymouth Corporation for about £104,000, were linked up with the Plymouth tramways, and a universal penny fare was inaugurated on all sections. Ashton-under-Lyne is seeking powers to purchase the Oldham, Ashton and Hyde tramways, while on the other hand the Notts and Derby Tramways Company is applying for powers to acquire the Ilkeston Corporation tramways.

Corporations running motor 'buses in conjunction with their tramways have generally done well. The Birmingham Council has the largest municipal fleet of 'buses, numbering forty-one, to which six are to be added. On the other hand, four electric battery 'buses owned by the Corporation of York made a loss of £450, though there was no trouble with the batteries or the electrical equipment.

At Brighton difficulties arose between the corporation and a company because the former would not grant the latter licences to run 'buses for hire in the borough, but this was later settled by the company buying up a rival and coming to terms with the council.

An interesting report on the future of the Edinburgh tramways was published in November, strongly recommending the corporation, when the time arrives, to substitute the trolley system for the existing cable system—the last of its kind in this country. An important decision in connection with the Oxford Electric Tramways Company's motor 'buses, which were declared to be in the class of "extraordinary traffic" on country roads, was made, and damages were awarded to the local authorities for resulting injury to roads. The use of mechanically propelled vehicles by municipal authorities for removing refuse, &c., is steadily extending. Many of these are electrically driven, and have been proved to effect a saving compared with horsed vehicles. In August there were in use or on order in this country 778 battery vehicles of all kinds, compared with 150 in 1914.

WATER SUPPLY.

Under existing conditions the task of reviewing the work of the water engineer during the past year is not easy. Wherever it has been possible to do so, work has been stopped first on account of economy and next because of the shortage of labour, materials, and machinery. It is undesirable to refer to work which has been carried out as a direct consequence of war conditions, and the result is that, as far as works of construction in this country are concerned, there is very little to be said.

Without doubt, water engineers generally have had a very trying time, owing to the great cost of fuel, the scarcity of labour, the long delays in obtaining materials, plant, fittings, and so forth. In addition to these troubles there has been considerable danger owing to the increased possibilities of water pollution and to the sudden and unexpected increase of population in various places where camps or other military establishments have sprung up. However, it is evident that the engineer has not been found wanting in dealing with the difficulties presented, and the country generally is to be congratulated upon the manner in which the water supply has been maintained.

On the other hand, the war conditions have undoubtedly tended to force the members of water boards and committees to rely more than was formerly the case upon the advice and judgment of the engineer. When suddenly faced with some great difficulty, without the usual resources for meeting it, the layman is apt to hang upon the advice of the engineer, as a drowning man will clutch at the object which will keep him afloat, and thus in many cases the scientific adviser has come into his own and has saved the situation. The direct result of the war has been to stimulate scientific research, and in the future we may hope to hear of much interesting work which is at present going forward which has for its object the treatment and purification of water.

Seeing that engineers and scientific workers in this country have either been engaged upon war work directly or else indirectly upon the no less important work of maintaining the supplies at home, under extraordinary difficulties, it is clear that they can have had very little time to spare for writing descriptions of works, books or technical papers, and it is not surprising to find that the bulk of the news of interest comes from

America or from countries less affected by the war. It is only natural that we should see evidences of greater intelligence in the various papers and reports which have been published, and in the general attitude of the engineer.

INTELLIGENT ECONOMY.

Mr. H. Percy Boulnois, in his paper on the "Maintenance of the Standard of Municipal Sanitation During the Continuance of War Conditions," read before the Royal Sanitary Institute, did good work in showing that no diminution in the quality or quantity of a water supply should be practised as a measure of economy, but that the engineer should look to the condition of the pumping station and filter beds, to the coal and lubricant consumption, and to leakage and waste. He further drew attention to the valuable service the public can perform in dealing with the detection and prevention of waste. It would surely be well that this point should be emphasised, and that the public should be better educated in the fact that waste of water is a matter of great national importance, which can best be dealt with by the individual.

Much the same idea seems to be in the mind of Sir John Wolfe Barry, who, in a recent contribution to the *Times*, drew attention to the fact that economy in the use of water by the individual consumer often means a saving in the consumption of coal. In the London area, for example, the Metropolitan Water Board estimates its coal bill for the ensuing year at £300,000 for pumping an average daily supply of 36 gallons per head for 6,750,000 persons. To the 190,000 tons of coal thus annually consumed must be added the amount of coal used by the London County Council in pumping this water again in the form of sewage. It would be possible to reduce this quantity of water materially, and thus to reduce the fuel bill, if the average householder were careful to stop all waste. There can be no doubt that there is daily allowed to run to waste in every house an enormous quantity of water which would certainly be saved if the person wasting it had to pump it up by hand from a well. The saving of waste such as this entails no hardship, but merely requires the exercise of a little thought.

No better illustration of intelligent economy exists than that of the sterilisation of the London water supply.

STERILISATION OF THE LONDON WATER.

London has at length adopted the policy of water sterilisation. This does not mark any new discovery, or even the trial of a new method; it merely means that after sterilisation by means of hypochlorite had been adopted on the largest scale at hundreds of places in America, and on a smaller scale in this country, the Metropolitan Water Board have at last recognised the obvious advantages of the method and have adopted it on a limited scale after being forced to do so by the growing impurity of the Thames water and by the urgent need of saving the cost of pumping and labour, at a time when the cost of fuel is prohibitive and labour very scarce. The fact that London has set this example will, when it comes to be known generally in the country, which is not [illegible] encourage other water authorities to make use of the process.

In these pages it has been urged, till readers must be tired of repetition, that, as water of very impure quality can be made perfectly pure by treatment, it is obviously possible to supply many places with good water by making use of the [illegible] at hand, thus saving the outlay on large works, which is impossible in many places, particularly in rural districts. Further, that in [illegible] the sterilisation of the water would not only lead to a saving of money, but would produce safety where a risk is now run.

The words of Dr. Houston's twelfth research report to the Metropolitan Water Board are certainly in agreement with such statements. We read that the practice of the water board has been to circulate water through the storage reservoirs in order to improve its *quality*; that this involves a large expenditure of money, as the water has generally to be pumped into the reservoirs; that the water is now allowed to pass direct on to the filter beds after it has been dosed with hypochlorite; that this treatment—viz., sterilisation—purifies the water to a higher standard than is effected by storage in reservoirs; and that the saving involved may be about 10s. per 1,000,000 gallons. Here we get a better result and a considerable saving of money.

During the summer 75,000,000 gallons of water were treated daily, and not a single complaint was received of taste or odour present in the water. There can be very little doubt, however, that if the general public had known that their drinking water was being treated with chloride of lime complaints would have been many. Such is human nature and the powers of imagination. The immediate effect of this treatment, moreover, has been that the life of the sand filters has been considerably prolonged. It has evidently taken Dr. Houston, who was the originator of the method of hypochlorite sterilisation of town supplies, all these years to persuade his board to adopt the method. We see here an excellent example of the fact that, while England possesses scientific workers, who have the ability to discover and perfect new methods, the bulk of the people do not attach proper importance to their work and advice, and that we allow other nations to reap the reward, and even to claim credit for the invention in many cases. One may reasonably ask how much money the Metropolitan Water Board might have saved if this process had been adopted years ago, and how much money the whole country might have saved if they had had an intelligent grasp of Dr. Houston's method.

FILTER-CLOGGING PREVENTED.

The report above referred to contains an interesting section dealing with the possibility of preventing the clogging of filters by chemical pre-treatment of the water. Such clogging is due very largely to algal growths in the water; if these are got rid of, or if their growth is prevented, the life of the filter is prolonged considerably, with a resultant saving of expense. By careful examination of the water it is, moreover, possible to tell when any sudden increase in the algal growth is taking place. Such an examination has an anticipatory value, inasmuch as the knowledge obtained may precede the actual occurrence of filtration and other troubles, thus allowing remedial measures to be put into operation in advance.

ADVANCES IN WATER TREATMENT.

Closely akin to this subject is the work of Prof. N. L. Huff and Mr. O. G. House at St. Paul, described in a paper read before the convention of the American Waterworks Association in New York. By careful attention to detail, and independent observations free from the usual consideration of precedent as a guide, it was observed that, in treating the water in a reservoir with copper sulphate for the removal of organic growths, it was possible to effect a very great economy in the chemical by applying it only where it was required. It was found that certain quiet, shallow pools were breeding-places for various organisms, and that by applying small quantities of the chemical at such points the main sources of trouble were checked. Very shallow bays, flat, muddy shores, and small ponds were treated by spraying the chemical over the surface with a hand pump. In the ordinary method, where a bag of the chemical is towed behind a boat, it is

to be observed that the worst places would be inaccessible, and would therefore receive no treatment. Further, that if a boat were taken through shallow, muddy places, much of the chemical would be absorbed by the organic matter disturbed from the bottom. In the old method the clearest water was over-dosed, and the worst places remained unaffected. The saving in chemical effected by the abandonment of the crude ordinary method was such that one part of copper sulphate sufficed for the treatment of 10,000,000 parts of water. This, again, is a striking example of the manner in which we may use our brains and obtain equally good results at much less cost if we have the faith and energy to do so.

Mr. C. P. Hoover, chemist of the Columbus waterworks, described a new process of water purification in a paper read before the American Waterworks Association. This process is an improvement on the process of coagulation by means of ammonium sulphate. In the new process syrup of alum is fed directly into the water supply. Lump alum, a combination of bauxite (a clay containing from 58 to 60 per cent alumina), is mixed with sulphuric acid and boiled until a basic solution of aluminium sulphate is obtained. The solution is then mixed with water, and this is then applied to the water under treatment. By this process five distinct steps in alum making are eliminated—viz., filtering, concentrating, crystallising, grinding, and redissolving. This process is very economical, and the annual saving to the city has been estimated at £1,200, the installation costing £2,400.

Water softening by electro-chemical methods has been described by Mr. C. P. Landreth in a paper prepared for the American Society of Refrigerating Engineers, and attention is called to the important fact that electricity will hasten chemical reaction, and thereby improve the results obtained with the ordinary water-softening compounds.

WASTE AND LEAKAGE.

In America the question of leakage from water mains has received considerable attention. From a paper read by Mr. A. H. Smith, it appears that the leakage from mains in the American cities is very high, which may go far to account for the enormous quantities supplied. Mr. Smith appears to think that a loss of from 30 to 40 per cent of the total supply is common, and even goes so far as to consider that a loss of 1 gallon per day per foot of joint is satisfactory.

Mr. C. P. Chase, in a paper read before the Iowa Engineering Society, said: "I would not be willing to guarantee a leakage of less than 10,000 gallons per mile in ordinary soils" on a pipe line.

It is clear that they do not know everything in America, but we have much yet to learn also in this country as to the prevention of waste, and it is probable that the war conditions will lead to a very great saving of public money in the future, simply because the force of circumstances will compel us to be more careful, and to make good the obvious defects in our systems before we spend money upon new works.

SCIENTIFIC CONTROL.

Prof. J. A. Fleming, speaking at the conference on "Engineering and Scientific Research," convened by the Society of Engineers, pointed out that the enormous destruction during the war of the productions of the engineer's shop and office would call for reconstruction, and offer a vast field for engineering work. Until we produced *more men who could do new things, and not merely know about old things*, it was futile for Great Britain to hope to gain pre-eminence over Germany in scientific industries. The advantages which we had in greater originality of mind and better workmanship were neutralised to a large extent by the want of a sufficiently thorough and broad scientific education to enable us to see the practical value of the openings given by scientific discoveries. It was the want of this sufficiently thorough scientific education which accounted for the limited faith of many employers and capitalists in scientific research, and for the inability of the practical worker to take advantage of, or see the meaning of, facts which presented themselves to him in his everyday work. The first condition of success on the business side of engineering must be association and combination, and the second, scientific method in all things. Prof. Fleming's remarks are entirely to the point, and tend to show how great is the need for highly trained men. The future possibilities with regard to engineering, and to water engineering in particular, depend entirely upon scientific control.

We see the growing tendency to nationalise various branches of engineering work; we find that coal mines, railways, and so forth are thus taken over by the Government, and it is clear that the nationalisation of our water supply must follow. This should lead to an enormous saving of money, and if the national system is under proper scientific control, the result will indeed justify the change.

ELECTROLYSIS.

The destruction of water mains due to electrolysis is a growing evil, and the importance of the subject is well recognised. The findings of the various authorities who have dealt with the matter in the past year are generally to the effect that prevention is better than cure. It cannot be said that very much more is to be gathered.

In a technologic paper of the United States Bureau of Standards, methods proposed for the mitigation of electrolysis of underground pipes were discussed by Mr. E. B. Rosa, chief physicist, and Mr. Burton McCollum, electrical engineer. The authors are of opinion that by far the greater part of the damage caused by electrolysis is that arising from the corrosion of underground pipes and cables, and that in general those remedial measures which are applicable to pipe systems should be regarded as secondary means of mitigation of electrolysis trouble, the principal resistance being proper construction and maintenance of the railway return circuit. In special cases, however, mitigative measures may be applied to underground structures. Of these, the two most commonly applied are the installation of insulating joints and the use of pipe drainage. The installation of insulating joints is a measure which may be adopted when the pipes are being laid, but where isolated pipe systems exist without insulating joints, and where no other underground utilities produce complications, pipe drainage may be effected by the use of insulated feeder systems, so adjusted as to take the minimum possible current from the pipes at all points. These methods should, however, only be used as auxiliary means of protection after reasonable precautions have been taken to reduce potential drops in the tracks to as low values as are economically possible.

Prof. Ganz, of the Stevens Institute of Technology, in a lecture upon this subject, drew attention to the comparative failure that has attended the use of paints or dips, and stated that no dip or paint will permanently protect a pipe against electrolysis in wet soil, and that the danger of electrolytic action may be even greater with such pipes than in the case of uncoated pipes. Experience has shown that stray currents may leave only from the bare spots, with consequent liability to concentrated corrosion. Prof. Ganz suggested surrounding the pipe with a layer of asphalt, about 2 in. in thickness; but, in most cases, the cost is obviously prohibitive. With regard to insulating joints, Prof. Ganz pointed out that it is sometimes possible to use comparatively few insulating joints to break up the electrical continuity of the line, and that insulating joints are particularly useful in cases where small service pipes are endangered by current

which flows to them either from the mains or from house piping.

At the annual convention of the American Waterworks Association there was presented by a committee on electrolysis a report giving evidence of increasing damage to pipes in cities from electric railways. As a remedy it was not proposed to deal in any way with the pipes, but to connect the station with the track at certain critical points by cable. Metallic connection between the pipe and track was not advocated. It appears that there is a disposition to criticise the proceedings of the representative committee which has been established in America, and which includes representatives of waterworks, gas, electric light and railways, together with the American Institute of Electrical Engineers and the United States Bureau of Standards, on the ground that the water engineers were practically overwhelmed by various electrical interests. The United States Bureau of Standards reports to the effect that paints, dips, and wrappings are not of much use in themselves, and that insulating joints offer but an imperfect guard.

FARMER COUNCILLORS AND ROAD WORK.

"RANSACKING" AND TACKLING THE BARNSTAPLE SURVEYOR.

At a meeting recently of the Barnstaple Rural District Council, Mr. J. Andrew complained of men being employed cleaning the water tables at such a time as the present, and mentioned that there was a man engaged in such work between Chapelton and Umberleigh. To his mind it was an entire waste of time, and the man would be much better employed on his farm than in doing that unnecessary work. There was scarcely a bit of stuff to dig up. A good part of the road had been to made, and there were no water tables, the road being carried to the foot of the hedge. It was a scandalous waste to keep men cleaning up when it was not required. He did not think there was a butt-load of material in forty landyards. There he was performing this operation at a cost to the poor ratepayers, and then not helping the roads. Could the surveyor let this man go on the farms for a while?"

The chairman (Mr. L. A. Alford): You just remarked that we shall lose our money from the county council if we do not keep the roads in repair.

Mr. Andrew: That does not mean to say we should do unnecessary work.

The surveyor (Mr. A. A. Richards): We cannot do too much cleaning of the roads, especially at this season of the year. They want all the attention you can give them.

Mr. Andrew: I entirely disagree; this is unnecessary work. It is not required. I would like to ask the surveyor to give his attention to the bit of newly made road, as it is getting into a very bad condition.

The chairman: No doubt Mr. Richards will see to it.

Mr. Andrew: Could this man be spared for the roads?

The surveyor: No; we want more.

Mr. J. Hobbs: If Mr. Andrew wants the man, all he has to do is to offer him a shilling or so per week more than he is now receiving.

Mr. John Bailey said he thought the surveyor must have the patience of Job to allow of his being "ransacked" and treated by every councillor as to what he should and should not do. He always looked upon the surveyor as a most efficient official who was to be trusted. They must all trust Mr. Richards. He could bring no complaints as well as other members, "but we shall drive the man off his head if we keep on."

The chairman: Mr. Richards appreciates any hints you can give him.

Mr. Bailey: I do not think he likes too much fault-finding.

Mr. Andrew: What are we here for if it is not to look after the roads?

Prosperous Tramways.—The reduction in the number and speed of motor omnibus with the advance in petrol has had the effect in Manchester of swelling the receipts of the tramways department.

MUNICIPAL WORK IN BULAWAYO.

ROADS, SEWERAGE AND SANITARY SERVICE.

"On account of the continuation of the war, the year has been one of depression, and consequently no new works of any magnitude have been taken in hand. Information, however, has been obtained, as opportunity offered during the year, for various future undertakings, such as water supply, sewerage, &c., which will be found useful when required."

Mr. Arthur H. Waller, ASSOC.M.INST.C.E., the town engineer of Bulawayo, South Africa, makes these remarks at the outset of his report for the twelve months ended June last. Among the works to which special attention has been given is that of road upkeep, and in this connection Mr. Waller says: "The streets recently hardened with graded granite are standing remarkably well considering the fact that the binding material available is of a very gritty nature, and that we have not the water to give sufficient street watering. New roads require daily watering for some time after construction, and it is pleasing to note that, notwithstanding the difficulties mentioned, only a very few small patches have worked loose. The approaches to the New Bridge, although well rolled before the macadam was added, have subsided slightly, but not to such an extent as was anticipated. The work could not be allowed to wait for soaking rains, which would have consolidated the filling. After next rains I anticipate that all settlement will have taken place, when any irregularity of the present road surface can easily be rectified. An excess amount of binding material has been recently spread on part of the surface in order to counteract the shortage of watering."

PROPOSED SEWERAGE SCHEME.

In January last Mr. Waller placed before the Public Works Committee a report on the question of slop-water removal by means of stoneware pipe sewers. Some few years ago this subject was brought before the council, when it was proposed to use 4-in. diameter steel pipes, collecting the slop-water only, from the various hotels, running it by gravitation to a point in the North Park, and pumping to the compound tank, where it was again to be pumped to the municipal farm. In his report the town surveyor pointed out the unsatisfactory nature of this scheme, and advised that stoneware pipe lines, with junctions for future connections, should be laid in such positions and of such sizes as to work in with, and eventually form part of, a complete system of sewerage. This system, in addition to providing means of disposing slop water and fæces from hotels and other institutions, would, he observes, considerably enhance the comfort and health of the community, and effect a considerable saving—after providing interest and sinking fund—on the present system.

The estimated cost of the scheme is, in round figures, £10,000.

SANITARY SERVICE CHARGES.

In the report of the chief sanitary inspector to the municipality, Mr. C. E. Hall, there are some interesting particulars regarding the sanitary service charges.

The cost of rubbish removals is provided for at a minimum charge of 5s. per month from all premises, so that there is a regular removal of all domestic and trade refuse. Where large quantities of refuse are removed a charge of 10s. per cubic yard is made.

The cost of slop-water removal is provided for at a minimum charge of 7s. 6d. per month, or 10s. per load of 300 gallons, except where special contracts are made, and on these charges an abatement of 25 per cent is given, provided prompt payment is made.

The cost of stercus removal is provided for at the rate of 10s. per pail per month, and extra pails at the rate of 8s. per month each (less 25 per cent abatement). For native latrines the cost is 2s. 6d. per pail per month (nett). For these charges there is a regular nightly service, clean pails being placed in the closets each night.

The cost of removal of dead animals is at the rate of 15s. for a horse, cow or donkey.

Edinburgh Tramways to be Purchased.—The Edinburgh Town Council have decided to accept the proposal of the Tramways Committee for the purchase of the Edinburgh and District Tramway Company's undertaking. Fifty thousand pounds is to be paid for 260 cars, and the company undertake to leave the rails in such a condition that at the termination of the lease these would be fit to carry on cable working for at least six years after the termination of the lease.

Ferro-Concrete Bridges on the Meuse.

[An illustrated article dealing with the Bouvignes, Rouillon, and Hermalle Bridges will be found in our issue of November 24th last.]

The town of Namur, formerly the capital of a countship acquired by Burgundy in the fifteenth century, and now the chief town of the province of Namur, occupies an exceedingly picturesque situation at the confluence of the rivers Meuse and Sambre. The town is on the northern bank of the latter river, on the southern side of which are the Citadelle, the Grand Parc de la Citadelle, and the Faubourg de Salzinnes.

Standing on a hill rising to a height of 705 ft., the Citadelle is on the site of an old Roman fort and of the castle of the Counts of Namur, two towers of the latter being still extant. The remainder of the plateau is occupied by the park, which constitutes a pleasant resort for those in search of recreation and sports, and the suburb of Salzinne lies to the north of the park.

Before the war, access to the plateau was readily obtained from the town by several bridges across the Sambre, and from the Faubourg de Jambes, on the eastern side of the Meuse, by a masonry bridge of nine arches.

Like every other form of construction, the celebrated forts of Namur, once believed to be impregnable, have succumbed to the destructive effects of modern high explosives, a fate afterwards shared by many formidable underground fortresses constructed by the Germans on the Somme and the Aisne, and regarded by them as absolutely impregnable.

FIG. 1.—RUINS OF MASONRY BRIDGE AT NAMUR.

Very little information is available as to the present state of the bridges across the two rivers. Probably they were destroyed during or after the bombardment of Namur, and have been partly restored for the convenience of the enemy. The only definite knowledge in our possession is that conveyed by the photograph reproduced as Fig. 1. This view was taken from the quay in the suburb of Jambes, and shows only a part of the bridge on that side of the river. The heaps of masonry in the waterway represent the remains of the arches destroyed, and above the *débris* are electric cables, pipes and tramway rails. On the extreme left is the Donjon of the Citadelle above the boulevard facing the river, the town being in the distance on the extreme right.

Of the two Hennebique bridges in Namur, one carries part of a track on the Plaine de Jeux, to the south-west of the Citadelle. As shown in Fig. 2, the ground is here of a somewhat rugged nature, and is of unstable character. The bridge has an arch-span of 132 ft., and was built entirely in ferro-concrete, the parapets being of masonry. Although quite unpretentious in appearance, this structure is one of fairly important dimensions, and was completed in the year 1911 for the Belgian Government under the superintendence of M. Dethy, Ingénieur-en-chef des Ponts et Chaussées.

FIG. 2.—BRIDGE ON THE CITADELLE HEIGHTS, NAMUR.

FIG. 3.—BRIDGE OVER THE SAMBRE AT NAMUR.

The other bridge at Namur crosses the river Sambre in a single arch of 170-ft. span and 10 ft. wide, being intended for the convenience of pedestrians between the town and the pleasant resorts on the opposite side of the river. This bridge, constructed for the Belgian Ministry of Public Works, is of striking design, as illustrated by Fig. 3, the slenderness of the arch being a noteworthy feature now tolerably familiar to engineers, but formerly regarded as a rather daring illustration of the elastic strength possessed by Hennebique ferro-concrete. The structure was in continuous use for a long period of years before the outbreak of the present war.

BRIDGES AT LIÉGE

An announcement was made nearly two years ago to the effect that all the bridges at Liége likely to be of future use to the Allies had been destroyed by the Germans. It is therefore probable that at least three of the examples of Hennebique bridge construction in the Walloon capital are no longer in existence.

Fig. 4.—Pont de la Boverie, Liége.

Of the four bridges described below, two cross the main stream of the river Meuse, one spans a new channel, known as the Derivation, of the river Ourthe, which flows into the Meuse at Liége, and the fourth is a railway bridge on the outskirts of the city.

The principal part of the city lies on the left bank of the river Meuse, between which and the Derivation there is a long island, sometimes termed l'Ile de la Boverie, occupied by another important part of the city, and affording excellent sites for the Institut d'Agronomie and the Parc de la Boverie. Beyond the Derivation are quarters consisting largely of industrial works and dwellings of the working classes, the region being traversed by the main and subsidiary channels of the river Ourthe all connected with the Derivation.

PONT DE LA BOVERIE.

This bridge occupies a central situation near the University, and provides convenient means of cross-river communication between the chief portion of the city and the Longdoz railway station, whence trains run to Namur, Aix-la-Chapelle and Maastricht.

As may be noticed on reference to Fig. 4, this is a masonry structure of five arches, the piers projecting above the roadway being standards for the supply of current for electric trams are passing over the bridge. Owing to the limited accommodation for vehicular and pedestrian traffic provided by the original design, it was decided by the city authorities about fourteen years ago to widen the bridge, and the project submitted by the Hennebique organisation was finally adopted and carried into effect during the year 1903. The essential advantages of the scheme were that it provided for a substantial increase in effective width in a particularly economical manner, without impairing in any way or altering the characteristic appearance of the structure.

By the simple expedient of applying ferro-concrete encorbelment for the addition of new footwalks on each side, the whole of the original width of the bridge was made available for the roadway, the result being akin to that secured by the widening of London Bridge, although the operations were executed in a far more economical manner.

PONT DES ARCHES.

The highly satisfactory widening of the Pont de la Boverie was followed a few years later by a similar adaptation of ferro-concrete corbelling to the Pont des Arches, one of the most beautiful masonry bridges across the river Meuse. Built some sixty years ago, this work carries the main highway from Brussels to Aix-la-Chapelle, across the river, and connects the two most populous quarters of Liége. For many years previous to the execution of the widening work, the bridge had been found absolutely insuffi-

Fig. 5.—Pont des Arches, Liége.

cient for the conduct of vehicular traffic, especially after the installation of three lines of tramway tracks. The total width between parapets was about 40 ft., and after providing for two footwalks, each 6 ft. 6 in. wide, only 26 ft. 3 in. was left for the roadway.

Owing to the continued growth of traffic, the work of widening at last became a pressing necessity, and as it would have been highly inconvenient to close the bridge for the execution of the work, M. Cornet, Ingénieur-en-chef, Directeur des Ponts et Chaussées, adopted a project submitted by M. Hennebique, and providing for the construction of corbelling which could very easily and rapidly be put in place.

The corbelling was formed of ferro-concrete slabs 5 ft. 3 in. wide by 16 ft. 5 in. long, about two-thirds of the length of each slab resting on the old masonry, and the remaining third projecting in cantilever for the support of new footwalks. The slabs are connected longitudinally by ferro-concrete beams and counterweighted by mass concrete, while as an additional safeguard the corbelling is anchored down to the original masonry. In all 144 slabs were required.

Fig. 6.—Pont Mativa, Liége.

and these were moulded in advance in a contractors' yard close to the site.

In order to obviate the stoppage of traffic, work was carried out in two longitudinal sections, the downstream half of the bridge being first taken in hand, and completed in six weeks. The other half was finished five weeks later. As remodelled the bridge has a roadway 13 ft. 2 in. wider than before, an important increase which was secured at a very moderate cost, and, as may be judged on examination of Fig. 5, without impairing the appearance of the structure in the slightest degree.

The joining up of the widened roadway and the new footwalks of the bridge with those of the adjoining thoroughfares was effected by constructing approaches curving outwards from the bridge, thus smoothing away sharp corners on each side of the river. These approaches were formed in ferro-concrete moulded on centering supported from the towpaths passing beneath the end arches of the bridge.

The ferro-concrete corbelling is faced at the outer edge by stone moulding, above which rises a stone parapet, the ferro-concrete being visible only from the river and towpaths.

PONT MATIVA.

This remarkable bridge was constructed early in 1905 over the river Ourthe, and opened in time to afford means of communication between two portions of the Exposition Universelle de Liége.

The bridge has a total length of 262·40 ft., and includes a central span of 180·40 ft. It is 32·80 ft. wide, and the thickness of the main arch is only 1·15 ft. at the crown. The slender proportions of the central arch and its exceptionally small rise, less than one-fifteenth of the span, were due to the requirements of the specification prepared by M. Jacquemin, the engineer acting for the Committee of the Exposition.

Fig. 6 is a view of the bridge, which was constructed entirely in Hennebique ferro-concrete, and passed a number of exceptionally severe tests in March and April, 1905. One of the tests was conducted by marching bodies of infantry and cavalry along the roadway under the superintendence of Colonel Algrain, representing the Belgian War Ministry.

It is possible that a good many practical tests of the same character have since been carried out by the Germans, if the bridge was not destroyed after their occupation of Liége.

SPECIFICATIONS FOR CONCRETE.*

By CLOYD M. CHAPMAN.

To be generally acceptable, specifications for concrete should fulfil two requirements—namely: (1) They should insure the production of suitable concrete if the aggregates are properly used, and (2) they should permit the use of materials found in the vicinity of the work, if such materials are capable of producing concrete of the required quality.

The present method of specifying may insure the quality of the material, but it does not permit the use of a wide choice of aggregates from which first-class concrete may be made.

Concrete is a cheap building material because it is composed largely of inexpensive aggregates, and for economic reasons these aggregates should be secured from deposits in the vicinity of the point of use. Whatever materials are locally valuable for aggregates must be used in the great majority of cases, for aggregates which must be transported long distances are no longer inexpensive. The material at hand capable of making concrete of fair quality will generally be used in preference to a better material which must be brought from a distance at considerable cost for transportation.

It is generally true that even a very poor sand—that is, one which compares very unfavourably with standard sand when tested in 1:3 mixtures with cement, will give a suitable compressive strength if sufficient cement is used. Where most excellent materials are available the present style of specification does not permit a variation of the proportions, however good the materials may be. For instance, some well-graded sands give strengths 40 per cent higher than that obtained with standard sand in the proportion of 1:3. Yet such sands receive no credit for quality under the present form of specification.

* From a paper read before the American Society for Testing Materials.

Specifications serve their purpose when they secure the products described, but they serve the industry best when broad enough to cover all the materials capable of furnishing a product of the desired quality.

In order to cover and include all materials which are capable of producing concrete of the quality required for the particular service it is to perform, it is only necessary to specify the result required instead of specifying the materials used. In this way it would be possible not only properly to safeguard the product, but to permit the use of such materials as are available in each locality.

LOCAL MATERIALS.

It is also true that in many cases the local materials are of such poor quality and would require such a large proportion of cement to fulfil the specifications, that it would be economical to bring in better material even from a considerable distance, the saving in cement paying the freight. Specifications of this kind might take some such form as the following, in which all figures are purely arbitrary and in no sense proposed as a standard:—

The materials used shall be of such quality and shall be used in such proportions as to produce a concrete which shall show a compressive strength of 2,500 lb. (or 2,000 lb., or 1,500 lb.) per square inch at the age of twenty-eight days when tested in accordance with the standard methods of testing.

This form of specification is obviously open to modification to cover varying conditions. For instance, to insure against concrete which sets or hardens slowly, and consequently requires forms being kept in place an unusual length of time, the specification may require a certain minimum strength to be attained in three days. Again, in sea wall or tunnel work, requirements as to permeability or density may be inserted either in place of, or in addition to, the strength requirement.

It would probably be desirable to add some further qualifying clauses, such as the limit of size of particles, the character of the materials composing the aggregates, freedom from constituents liable to cause deterioration, and the like.

The method at present most commonly employed is practically to ignore the quality of materials except the cement, and arbitrarily to specify proportions that will give good results with almost any aggregates. Wherein lies the incentive to a contractor or builder to use any better materials than the cheapest if he is compelled by the specifications to use a certain arbitrary mixture, regardless of quality or material?

Any specifications for concrete aggregates which are to be used all over the country must be so drawn that any material which will make concrete of the required quality will be included.

TESTING.

In operating under such specifications it is of great importance that specimens of the concrete produced be regularly made and tested. It is also of the greatest importance that a close day-to-day check be maintained on the quality of the materials used, so as to insure a reasonable uniformity, and to know that these materials are at least equal in quality to the materials used in arriving at the proportions required to give the quality of concrete called for in the specifications.

Having once established by test the suitability of sand and stone for any grade of concrete, and having determined the proper proportions in which to use them to attain a certain desired result, it is only necessary thereafter to see that the size, grading and proportions of these materials are reasonably constant to insure uniform quality of concrete. Such a check on size and grading should be had on each and every shipment of material, and is easily obtained with a small set of sieves, or, in the case of sand, which is by far the more important material, by means of a self-contained sand tester.

The regular and systematic testing of the size of the aggregates gives data which will permit the engineer to tell without further tests whether the aggregates will produce a better or poorer concrete than that produced by the original or standard sample. This fact is based on the well-established principle that, other things being equal, the aggregate whose granulometric-analysis curve most nearly approaches the line of maximum density will produce the best concrete. This makes it possible to determine with reasonable certainty which two sands of the same kind and from the same source, but differing only in fineness, will make the better concrete.

Decimal Weights, Measures and Coinage.

By EDWARD C. BARTON, F.R.G.S., Brisbane, Queensland.

The time has come for a decision to be made as to the future of measurement and its language throughout the world. Commerce has so interlaced the nations that, even in war, they are all affected. Through the exchange of scientific records they are keenly interested, at all times, in the use of each other's results, and the scientist has long ago decided in favour of an international set of units. He has adopted the metric system as the only one which agreed with his requirements, and it is used in every scientific process of manufacture in the world, whether in Lancashire or on the sugar plantations of Queensland. Commercial and industrial men are considering its suitability to their wants in this country. Australia and New Zealand have long ago decided in its favour and only await the signal.

Ever since the Florentine philosophers wasted their time in making experiments in heat with unstandardised thermometers it has been apparent to all that the value of a record depends upon the terms in which it is made. The units of measurement in regard to land are particularly important in the making of those priceless records that form the foundation of all structures, whether of masonry or agriculture, which are inseparable from advanced civilisation. Those units should be few and correlated among themselves by one simple proportion. They should also be correlated with other measures in such a manner that any lost units may be easily replaced with exactitude.

The metric system of measures and weights fills all these requirements, and no other system has ever done so since the fall of Babylon. In the matter of proportion, it may be claimed that systems such as our "Imperial," with its variants of duodecimal and binary proportions, is superior to the metric, but the fact of 10 being the common basis of the metric system and of our counting system is such an overwhelming advantage that its non-divisibility by 4 or 3 becomes relatively unimportant. The further fact of the metric system using only one basis of proportion makes it superior to any system with many bases such as ours with its 15 different proportions, including 5½ and 30¼.

The surveyor is entrusted with making the most important records of the nation, and his work should be durable and accessible to all. This means that it should be written in a durable set of units. If his present units are doomed to disuse, his work will be robbed of much of its value. Therefore it is important that he should make his mind up on the subject of the oncoming battle between the imperial and the metric systems.

When he remembers that the whole of the scientific world is metric, and that half the commercial world is also working on the same system, and when he further thinks of the fact of whole industries, such as the motor trade, the chemical trade, and an increasing number of other engineering trades which are partly or exclusively doing so, he must realise which system is dying. It is needless to point to Russia with its 180 millions and its freedom from the metric taint. Russia has its own measures, and no country has ever abandoned its own except to adopt the metric system. The great Republic of the United States also has been looked upon as a bulwark of our system, but that country is held by the ideas of its two best customers—Canada and Great Britain. It would be unwise on their part to do otherwise, and yet there is a great agitation over there for the metric change. Even in our own country we find that practically every Chamber of Commerce which has looked into the matter has resolved in favour of the same change. Recent examples are the Coventry, Gloucester, Southampton, Woolwich Chambers, while the Engineers' Association of Manchester passed the resolution by a tenfold majority.

Whether such progress of the metric system is likely to meet with a reverse is dependent on its inherent advantages, and so it will be well to enquire further into the details of the controversy.

EDUCATION.

Here we find that the business aspect of the question usually hides the more important one of education, the mention of which leads the admirers of our system to praise it for its value in arithmetical gymnastics, and to describe the metrists as poor users of the multiplication tables. The question is wider than this. On September 3, 1916, the *Times* reported the compromise made between the classical and the science masters of England, whereby the classical men agreed to an unlimited amount of science, provided that it left them with just the present quantity of classics. This means that room must be made for science at the expense of some other subject, and not by cutting down the classics. Science has been notoriously neglected among us, and our mathematics have suffered from the want of that life-giving force which arises from its application to the higher uses and produces the real scientific spirit so necessary in the world of finance and statesmanship. With the usual limitations to school years, there is not time for such a development and for the classics in their present strength. When the whole work is handicapped by the use of disconnected weights and measures gathered from all the neighbouring nations, during our march into civilisation, the task becomes wellnigh hopeless. If the metric system were adopted, the work of teaching science would not only be aided directly, but we should be able to shorten up the hours devoted to common arithmetic, and "practice" to the extent of so many hundred hours as would be equivalent to another year or two years at school. If the coinage were decimalised the gain would be still greater.

CLEARNESS OF THOUGHT.

Surveyors have, through their adoption of the chain of 100 links and through the decimal division of the acre, shown their appreciation of the ease of thinking in a system which agrees with our system of numbers, and which brings out the beauty of that wonderful invention the "Arabic Method of Notation." Few can realise at the present time the difficulties which beset the originators of our "Imperial" measures, and forced them to adopt such small proportions as 4 gills to one pint, 2 pints to the quart, 2 gallons to the peck; but a fair idea may be obtained from an attempt to make out an account in the Roman numerals which they had to use. Addition was very difficult, subtraction was more so, and to multiply involved the use of pebbles or dried peas. Few could write, paper was unknown, ink was unobtainable, and most records were made with a knife on a stick. A receipt for taxes paid to the King's treasurer was given in this manner, and the stick was then split. One-half was retained by the treasurer and called a "tally" (from the French word "tailler"). Paper was not made by machinery until 1803, and so this old method of giving receipts was not abolished until the time of Napoleon, and the last great burning of the "tallies" took place at Westminster in 1837. It resulted in the destruction of the Houses of Parliament by fire.

THE ADVENT OF ARITHMETIC.

The use of arithmetic as we know it was only possible with paper at a price within the reach of all, and the real usefulness of the "Arabic notation" was not really felt by the many until the end of the eighteenth century. Men like James Watt, of steam engine fame, appreciated the changed situation, and it was he who wrote to a French savant suggesting a decimal system of weights and measures, thereby leading to the creation of the metric system as finally evolved by the French Government of that day. Unfortunately, the system was left to the Revolutionary Government to promulgate, and that led the other nations to look upon it with disfavour. Even Napoleon had to disown it when he was trying to establish himself among the royalties of Europe as a respectable member of the community. The system has outlived that "odour of the guillotine," and we see it to-day supreme in the scientific work of all the nations of the earth. Neither prejudice nor national vanity need therefore trouble us, and we might advantageously remember that the great French nation have voluntarily abandoned the meridian of Paris in favour of our Greenwich meridian, although theirs was the older.

ELECTRICAL UNITS.

In electrical work it is not only supreme, but it has influenced the whole nomenclature. The electrician

saw that he would be wasting the powers of "Arabic" arithmetic if he adopted small proportions, such as 2, 4, or 8, and eschewed them in spite of their binary qualities. He also saw that even steps of 10, as in the metric system, were an absurd pandering to the prejudices of folk that could only think in quantities of 4 gills and 2 pints. He had seen the survival of the tonne of 1,000 kilogrammes, each of 1,000 grammes, each again of 1,000 milligrammes, with a long list of defunct hectograms, decagrams, decigrams, centigrams, and he boldly went for steps of 1,000, but he adhered to the nomenclature of the metric, so that he now has the kilovolt of 1,000 volts, and the volt has 1,000 millivolts. He has his kiloampère for measuring heavy currents, and his milliampère for the small. With him, as with the metrist, kilo always means a thousandfold, and milli means a thousandth part.

The full advantages of such interrelationship between all units present and future cannot be secured by any other than a décimal system throughout the world of science and industry, and the metric fills the requirements well. The advantages are not confined to clearness of thought in ordinary commercial matters, such as the reckoning from the weight (say, 83 kilograms for 8-gauge iron wire) per kilometer to get the weight of one meter (*i.e.*, 83 grams), or reckoning prices such as that of a litre of ale from the price of the hectolitre (a hectolitre at 30 francs is the same as a litre at 30 cents).

It also eases the processes of calculating in percentages, such as densities of liquors, expansions by heat in measuring apparatus. A fall of 1 millimeter of rain on a hectare gives 100 litres of water weighing 100 kilogram. The same fall on a square kilometer would give 10 tonnes of water. Then the important matter of tabulation and of expressing them in curves is much assisted by the fact that one system of division—*i.e.*, for ruling the paper—will cover efficiencies (in percentage) and densities (in percentage) as well as the absolute quantities and lengths, areas, volumes, prices, discounts, &c.

DIFFICULTIES OF THE CHANGE OVER.

The troubles connected with the change of system have been, in countries which have adopted the metric system, or have introduced decimal coinage, insignificant, compared with those which were anticipated. Men eminently qualified to judge of the mental peculiarities of the Eastern mind, such as Sir Hercules Robinson, predicted riot and revolution as the effects to be expected from such action, and yet we find that the decimal coinage was brought into use in Ceylon without the slightest trouble. In six weeks the "great event" was forgotten. In the matter of weights and measures the operation is more serious, and therefore time is given for a more gradual change, usually five years. The great concerns of the country, especially the great Government departments, take the lead, because they see the danger of letting long contracts on the old measures. Manufacturers, such as the tool makers, who have to make and stock two sets of drills, &c., press their customers to make the inevitable move. The farmers, who have in this country been clamouring for decimalisation of all weights and measures (*vide* the resolutions of the Congress of Chambers of Agriculture in London, 1911), may be expected to assist in bringing the new measures into general use throughout the country.

OPPOSITION TO BE EXPECTED.

As in all matters, there will be a considerable number opposed to the introduction of new methods. There will be the class of men like Lord Brougham, who see "paving stones flying around the heads of the people who permit gas to be carried under their streets," as there were those who feared that the British Empire would fall with the abolition of the pigtail in our Army. Those people are not to be seriously considered, but there is a class of people who oppose the change from more cogent reasoning—*i.e.*, the engineers and the textile manufacturers. For the ordinary man and woman it will be a nine-days' wonder, like the "Daylight Bill," but the owner of machinery that turns out a product on the inch or yard measures knows that he must meet the new condition of things with his existing plant. The retail dealer can retain his scales and need only replace his weights, but the engineer who has all his capital in plant must run it many years before he can replace it with machines made to the new measures. He has been told by alarmists that all this plant will be seized and thrown into the scrap heap, and one engineer, Mr. Brough, became so excited about it in 1907 that he tried to scare the rest of the community by telling them that they would have every gas pipe torn out of their houses unless it was made to millimeter sizes. He forgot that the bricks were all to inch sizes, or he would have had his imaginary England reduced to a heap of ruins by the mad metrists.

Few engineers or other manufacturers believe such tales to-day, but they still feel apprehensive as to their being able to sell the product of such machinery, and are only gradually becoming convinced that the change, when it is enacted, will only affect dealings where the money payable is the product of some weight or measure multiplied by a price. They will still be able to make and sell their product, even though it be bolts of $\frac{7}{8}$ in. diameter or cloth of 42 in. width, but the bolts must be sold by the kilogram or the tonne, while the cloth must be sold by the meter, and not by the yard of length. Thus the user of machinery built on the "inch" basis stands in no danger whatever. Curiously enough, those who seek to scare him with this supposed danger know that goods are manufactured on the old measures in all metric countries, and actually make it their chief argument as to the failure of the metric system. The great watch industry in Switzerland held out for twenty years and then *voluntarily* became metric.

As against the elements which retard the introduction of the metric system there is the necessity for meeting the "after war" trade conditions, and securing our full share of oversea trade. Here every turn brings fresh evidence of the advisability of not only making the change to metric measures, but also of decimalising our coinage as well. Russia is probably the greatest fresh market that the world offers, and it does not use our system, but has one of its own, as remarked before. It is not a metric country, but all those departments of its government which have abandoned the local system have adopted the metric—the surveys of the hydrographical department, and some others, the military, both in field and in ordnance work—while all manufacturing is done on the metric system. All the rest of Europe is metric and has a decimal coinage. In coinage we have only Siam and Persia left to keep us company. The Australian states and New Zealand many years ago pleaded for drastic decimalisation through their Premiers at Imperial Conferences, and they now have the law on their Statute books, only awaiting a move from this country.

There is another source of pressure favourable to the decimalisation throughout, and that is the increasing cost of clerical assistance for our offices. This can only be met by the introduction of machinery for counting and book-keeping. Unfortunately, our coinage system calls for machines, such as cash registers, arithmometers, &c., of a costly and complicated type, and we need another and more costly machine for our weights, and another for each of our measures, and, although one company has faced the expense of catering for our "money" machine, none have been so bold as to tackle the others.

CONCLUSION.

In the above it has been shown that our Imperial measures belong to a bygone age, to which they were suited, while the metric system is well suited to our present state of civilisation, and has already advanced to the position of being the only possible universal system, being exclusively used by half the civilised world and by the scientific portion of the other nations. From the educational point of view it alone can bring relief to our over-loaded school children, and allow of science entering into the training of the nation. Not only will the children have less burdens, but they will carry with them through life a set of weights and measures which they can remember and use without short cuts, mnemonics or pocket tables. It has been shown how the metric nomenclature adapts itself to the new sciences, such as electricity, and how it leads to clear thinking in the workshop and the office, while it permits, as soon as the coinage is decimalised, the use of reasonably priced machinery to increase the output of the clerical staff in the counting-house, and enhances the value of diagrammatic methods of visualising industrial and financial processes by curves. It has been shown that the textile and engineering industries have nothing to fear, while they and the merchant have everything to gain in both oversea trade and in economy in the office from a change that will bring us into line with other nations and with our own scientific men.

THE ASHFORD TUBE WELL STRAINER.

The above-named strainer is the result of a long series of experiments conducted by the patentee, Mr John Ashford, superintendent of the central workshops, Public Works Department, Amritsar, Punjab, India, with a view to finding a satisfactory and economical arrangement for drawing large quantities of water from sandy soil without drawing away sand and thereby causing cavitation and sub-sidence of the soil.

The need for such a device had been greatly felt in India not only for submerging areas water-logged by seepage from irrigation canals, but also for irrigating land not served by canals, and for town and village water supplies.

It is estimated that over 50 per cent of the water entering irrigation canals is lost by seepage, with the result that land in low-lying districts becomes swampy and unfit for cultivation. The reclamation of such water-logged land had been attempted by pumping from open tanks and from long, deep trenches, but the results proved disappointing.

Pumping from ordinary masonry wells and from tube wells made by wrapping woven wire mesh round perforated tubes had also been tried. With the former, the volume of water yielded by each well was so small that to obtain even a moderate quantity a large capital outlay was necessary, while with the latter the amount of water fell off rapidly, due to the choking of the wire mesh round the tube.

The following are the conditions that a satisfactory tube well strainer must meet:—

1. It must be strong enough to resist the pressure of the earth surrounding it at a considerable depth.

2. It must exclude all but the very finest sand, and be so made that grains of sand cannot choke it and prevent the admission of water.

3. It must be strong enough to be proof against attempts by percussive treatment, before and during the process of sinking.

4. It must be durable.

5. It must maintain its efficiency under any pumping conditions.

6. The joints between successive lengths of strainer pipe must be strong, easily made and sand proof, while allowing a slight flexibility in the strainer to permit of deviation from the straight in sinking.

(7) The price must be within the purchasing power of the agricultural classes.

The claim is made that three years' experience in the use of Ashford's patent tube well strainer has proved that it meets the above conditions in a satisfactory manner.

The strainer consists of a framework upon which wire is wound at high tension through steel rolls which give it a wedge-like shape, so that when in use the wire presents a flat surface to the surrounding strata with a slit between each strand of about 100th part of an inch wide.

The jointing of the lengths of strainer together is effected by screwing the ends of the bars upon which the wire is wound, and by bringing the notched ends of the bars to be joined together, so that the ends of the bars overlap, when a steel ring in halves, with a projection to fill the notches in the bars, is applied, and the two halves of the ring securely bound together with wire. The bottom of the strainer is finished off with a conical end, and the top is connected to the rising main by a suitable fitting.

The Ashford tube well will not silt up when pumped clear, and it extracts sand when pumped rapidly. There appears thus to be the interesting result that the well-screen material, giving so small an opening, need be strong enough to be used for a tube well.

Pumping has been in progress from an Ashford tube well fitted with 2-in. strainer at Amritsar, India, without any trouble from sand or silting. The tube well in question after sinking was coupled to a centrifugal pump and 23 cubic ft. of water per minute was at once pumped out of it without any trouble.

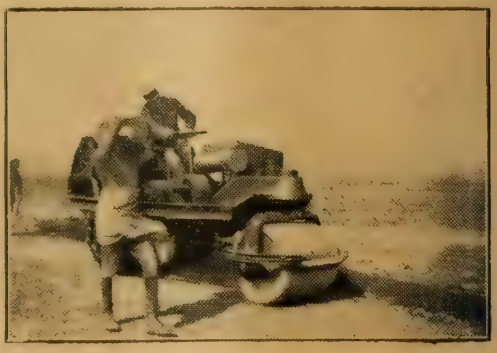
A tube well of similar kind, in the Punjab Irrigation Department's nursery at Amritsar, was so arranged that all the water was first discharged into a tank 2 ft. by 1 ft. by 2 ft. 6 in. deep. It was found when this well was first started that 12 cubic ft. of mineral matter was deposited in the tank during the first run of 5 hours with a discharge of 23 cubic ft. of water per minute. After that the amount of mineral matter kept steadily diminishing from 12 cubic ft. in 5 hours to 3 cubic ft. in 5 hours.

A 5-in. well that has been in use for three years pumping daily, and for much of its time night and day, has been completely free from any trace of sand for the greater part of the time.

It only remains to say that Messrs. Stewarts & Lloyds, Limited, Glasgow, Birmingham, and London, are the makers of the strainer.

MOTOR ROAD ROLLERS.

Barford & Perkins' motor road rollers have been very greatly in request during the past twelve months for making and repairing military roads at the different Fronts. The sizes that have been mostly used are the 8-ton and 9-ton rollers. In almost every



case the machines have been fitted with paraffin engines, and very excellent reports have been received as to the usefulness of the rollers. The illustration shows one of these machines at work on the shores of the Mediterranean.

METAL WELDING.

THE BARIMAR PROCESS.

As within the next few months it is of the utmost importance that every agricultural implement in the kingdom should be available for use on the land, if the aims of the Board of Agriculture and the Food Controller are to be realised, the attention of the farming community cannot be too strongly directed to the modern system of scientific welding, by means of which broken machinery (of any metal) may be quickly restored equal to new. Barimar Scientific Welding experts, of 10 Poland-street, Oxford-street, London, who have successfully replaced the German specialists in Britain, are making special arrangements to deal promptly with agricultural machinery in view of the urgency of the situation.

During the past few years the Barimar welding business has grown to such an extent that it has gone beyond the limits of the motor trade, to which at the outset it was confined, with the result that to-day the firm's factories handle work for H.M. Admiralty, War Office, Crown Agents for the Colonies, Royal Ordnance and leading munition works, Royal Aircraft factory, armament constructors, shipbuilding yards, railway companies, municipal bodies, collieries, and Britain's leading engineering firms. The company's work covers repairs of all kinds—large and small—and such is their organisation that fractures in all parts of the kingdom can be executed with a minimum loss of time.

Protection of Concrete in Cold Weather.—Experiments have been conducted at the Lewis Institute in Chicago to determine the effectiveness of manure as a protective covering for freshly-laid concrete to prevent disastrous results in cold weather. In these tests slabs of concrete exposed to outdoor conditions were covered with 2, 4 and 6 in. of fresh manure obtained from a livery stable. The results proved that the 4-in. and 6-in. layers had high protective qualities and were sufficient to afford the concrete a protection against a drop of 25 or 26 degrees in temperature. The manure should not be allowed to come in direct contact with the freshly-laid concrete.

Works Projected by Local Authorities in 1917.

Schemes which in normal times may have been regarded as desirable, expedient, or even necessary, have been reduced under the stress of war to the position of a mere catalogue dependent for fulfilment upon the vision of that peace that shall revive industry and re-establish progress in municipal enterprise. For this reason the information contained in the following pages lacks the fulness to which we have been accustomed, and also to a measurable extent the interest we have hitherto claimed for it. Constructional works, except those that serve the purposes of the nation, are at a standstill. To a large extent labour is diverted from the paths of peace into the field of war. So many municipal engineers and surveyors, the members of their staffs, and employees are serving in the Army and the Navy that the works projected are of necessity reduced to a minimum, and even these are carried out under constantly increasing difficulties. It will be unnecessary, therefore, to say more than that we have used every effort to make the record appended as complete as possible, and that we have received, as indeed we always have, a ready and hearty assistance from our correspondents in the compilation of these pages.

Aberdeen (Mr. JOHN GORDON, ASSOC.M.INST.C.E., burgh surveyor and tramways permanent way engineer).—It is probable that no new schemes of any magnitude will be proceeded with, and that only maintenance and absolutely necessary works will be carried out. The maintenance work will include the ordinary routine work of street and road repairs, the necessary repairs to sewers, and keeping in thorough working order the tramway permanent way. This latter will include the repair or renewal of several junctions which are getting into bad condition. With regard to any works which may be proceeded with on the termination of the war, the city council have not yet considered the matter, but in this connection the following schemes must receive first consideration—viz.: Duplication of part of the main outfall sewer; various extensions of the tramway system already authorised by Parliament; an extension northwards and southwards of the esplanade along the sea beach, as authorised by the Act of 1907; repaving certain streets, as authorised by the Act of 1915; the construction of an improved access between the two northern districts of the city; and the prevention of coast erosion.

Aethwy, Anglesey (Mr. J. KERSHAW, surveyor to the rural district council).—The chief work under consideration by this council is the reconstruction of the sewerage of Llanfair P.G., Anglesey, including new waterworks. The present system of sewerage is for waste water, &c., only, but water-closets have recently been allowed to be connected. The matter was so important that a section has already been relaid, but a very minimum gradient is available. The council have also constructed a lengthy sea wall at Penmon, Anglesey, from the design and under the supervision of the surveyor. A large housing scheme is contemplated at the termination of hostilities.

Aldershot (Mr. FRED. C. UREN, surveyor to the urban district council).—The restrictions imposed upon local authorities in regard to expenditure have prevented the council from embarking on any works of importance. Appended is a list of the chief works which the council contemplates carrying out on the termination of the war—viz.: Erection of sixty working-class houses; road widening in Newport-road, Church-lane East, and Ayling-lane; erection of preparatory school; extension of the sewage farm; new elementary schools; town planning; and the question of provision of tramways.

Alton, Hants (Mr. G. BERTRAM HARTFREE, F.R.SAN.I., M.INST.C.E.I., surveyor to the urban district council).—The projected schemes include proposals for further works of surface and spring water drainage at the conclusion of the war; waterworks extension; private street improvements and other works delayed by the war.

Ardsley (Mr. J. MORLEY, engineer and surveyor to the urban district council).—During the past year considerably more surface tarring of roads was carried out with a view to economy, and in view of the result, the same method will be employed again this year. It is proposed to supersede the existing steam plant at Brodelley sewage works by a complete electrical pumping scheme. Public and private conveniences are to be erected at the Stanley-road depot.

Barnet (Mr. W. B. CHANCELLOR, M.I.M. AND CO.E., engineer and surveyor to the urban district council).—The works to be undertaken in 1917 include the reconstruction of the High-street or Great North Road. The works contemplated on the termination of the war are: Refuse destructor, tar-macadam and asphalt works; extension of the housing estate (fifty houses); the town planning of Totteridge and Arkley (2,400 acres); the sewering of Totteridge; and the making up of several new streets.

Barrow-in-Furness (Mr. W. C. PERSÉY, borough engineer and surveyor).—With regard to work proposed to be carried out during the ensuing twelve months, owing to the depletion of men and staff, very little more than the absolutely necessary routine work will be done. The widening of Mill-lane, at an estimated cost of £3,000, will, however, be proceeded with, as this is required by the Admiralty. The chief works in contemplation at the termination of the war, and estimated cost, are as follows: New secondary school, £70,000; heat engines laboratory, £1,150; new elementary schools, £30,000; painting of schools, £1,650; tar-macadam playgrounds to new elementary schools, £1,350; new police station and courts, £16,000; tripe-dressing and gut-scraping sheds at abattoirs, £2,125; new pavilion, Biggar Bank, £3,500; completion and laying out of public park, including the provision of tennis courts, £3,450; completion of road on Biggar Bank, £650; fencing and laying out portion of Vickerstown Park, £600; tar-macadam plant, £1,000; road repairs, £8,000; private street works, £12,168; new roads and road widenings, £5,630; refuse destructor extension, £3,000; underground convenience, Cornwallis-street, £850; motor garage at store-yard, £350; electrification of sewage pumping plant (completion of), £350; laying out of roads, Devonshire-road hospital, £400; steel hoppers for clinker crusher, refuse destructor, £200; street works on Risedale estate, £1,715; and restoration of stonework, town hall, £300.

Bedale (Mr. T. W. METCALFE, surveyor and sanitary inspector to the rural district council).—Beyond the ordinary routine work of the department, the only works projected for the ensuing twelve months are the improvements to sewage disposal works and laying half a mile of new sewers at Bedale, and laying additional sewer at Aiskew.

Belper (Mr. THOMAS FENN, surveyor to the urban district council). Providing that labour and materials are available the following matters are intended to be carried out during 1917—viz.: The surfacing of part of Derby-road and Derby-road bridge length with tar-macadam; metalling of the main and other roads as usual; tar-spraying of roads and paths; renewal of a portion of path in King-street; rounding off of Green-lane corner; the resurfacing of the approach road to the swimming baths; painting of the superintendent's residence; renewal of fittings needed to one of the engines at the outfall works; improvement to the outlet of the sedimentation tank

and the painting of Springwood Cottage. The duplicating of a portion of the 9-in. pumping main is abandoned for the present as labour is not available.

Bilston (Mr. VINCENT TURNER, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—The council are cutting works down to bare necessities, and Mr. Turner himself is leaving in the course of a few days to take up a commission in the Royal Engineers for road service in France. During his absence Mr. W. T. Edgar Fellows, surveyor of the Wilmslow Urban District Council, has very kindly undertaken to supervise the work of his department.

Bognor (Mr. OSWALD A. BRIDGES, M.I.E.S.N.I., engineer and surveyor to the urban district council).—No public works of any importance will be carried out in this progressive seaside town until after the war. The urban council are ready to proceed with extensive improvement schemes when things are normal again, and not until then. The money market will no doubt be an important factor, which will decide when schemes can be carried out to the advantage of local authorities. When money is cheap again schemes can be pushed forward. At Bognor the first scheme to be undertaken will be the lengthening of the sewer outfall pipe, and the building of a new pumping station, estimated to cost £10,000. The widening of the Promenade Marine Drive and new sea wall, opposite the Pier Head, will involve an expenditure of £8,688. The building of 150 cottages for the working classes is also contemplated, as well as the construction of a bathing pool opposite Rock Gardens, where bathers can enjoy a sea bath under ideal conditions at all states of the tide. This scheme it is anticipated, will form a great feature of the sea front and be a good source of income. The outer wall will form a promenade, and in the evenings the bathing pool will be used as a lake, and be encircled with festoons of electric lights, and electric gondolas will ply for hire upon the water, decorated with electric lights. The winter garden, which will be just behind the bathing pool on the south side of the Promenade, will contain accommodation for a large concert-hall overlooking the sea, with verandahs and sun shelters for those in delicate health, reading, billiard, and tea rooms. Medicated baths upon the latest and most up-to-date principles will also be provided. On the lawns in front of these buildings will be constructed a bandstand of elegant design which can be encircled with glass shelter screens to protect those wishing to enjoy the strains of the best music by military bands during windy or inclement weather. Nearly £700 is spent annually on rock lands, which have proved a source of much profit to the town in past years. There is no place on its size which caters better for the enjoyment of its visitors than Bognor. Its unrivalled sands are another great asset to the town.

Boston, Lincs (Mr. G. E. CLARKE, M.I.M.C.E., borough surveyor).—All work is cut down to the lowest possible limit, and the only project at present authorised after the war is a destructor. As regards the docks, large improvements were contemplated, but it will still be some time before they can be carried out. The borough surveyor is fully occupied with Admiralty work.

Bridgend (Mr. WILLIAM BEVAN, surveyor and inspector of nuisances to the urban district council).—[illegible] council; propose after the war to build new council offices and a fire brigade depot.

Buckfastleigh (Mr. L. M. WILLIAMS, engineer and surveyor to the urban district council).—The council will continue the necessary work to keep the main and district roads in order, as well as a certain amount of tar-spraying. Some of the roads have been badly damaged by excessive weight of traffic in hauling coal thereon, and as soon as this is finished the council intend to repair the roads and put them in good condition. After the war a small housing scheme will be carried out.

Burnham (Mr. WM. H. CROWTHER, engineer and surveyor to the urban district council).—The council have nothing of importance in contemplation for this year. After the war, however, it is intended to proceed with the construction of a new service reservoir, and the laying of 2 miles of 12-in. cast-iron main, with other works in connection therewith.

Bury (Mr. J. AINSWORTH SETTLE, ASSOC.M.INST.C.E., borough engineer and surveyor).—For the duration of the war all works of any magnitude are held up. At the close of the war a busy time will be experienced in road and street work, as all except absolutely necessary maintenance is held in abeyance. Nearly all the office staff are with the Forces, and a number of workmen and others from Bury have joined recently for road making in France. The work to be taken in hand at the termination of the war will include the resewering of a large district, the provision of a housing scheme, and the usual highway and street improvements.

Chard (Mr. FRANK NICHOLSON, interim district surveyor to the rural district council).—There are no works of particular interest contemplated more than the employment of one or two batches of 100 prisoners of war, each for quarrying and breaking macadam. The council intend to take over the quarries under their direct management. Neither is there anything of particular interest definitely settled upon after the war, with the exception of again taking up a Road Board scheme of resurfacing and improvement of 16¼ miles of main road, at a cost of £20,266, with an alternative scheme costing £24,000, both of which were put forward at the beginning of last year, but were dropped owing to the war. Other works will be the making good of work on roads severely restricted at present through labour shortage.

Chelmsford (Mr. PERCIVAL T. HARRISON, ASSOC.M.INST.C.E., borough and water engineer).—The only work in contemplation, apart from routine, is the completion of urgent works of water supply and sewerage, and the adapting of additional land at the sewage farm for sewage disposal purposes. The presence of thousands of troops largely increases the work of the different departments, already handicapped through shortage of labour. The following list of schemes has been forwarded in response to the Local Government Board inquiry: Wood paving; widenings in Galleywood-road, Sandford-road, and Lady-lane; tar-macadam resurfacing scheme; public conveniences in recreation ground; refuse destructor; new sewerage scheme for borough; new waterworks pumping station; and making up several new streets.

Cheltenham (Mr. J. S. PICKERING, M.INST.C.E., borough surveyor and water engineer).—All work which could possibly be suspended is being held over during the war. In compliance with the notice from the Local Government Board, particulars of works contemplated after the war have been forwarded in accordance with the following list: Additional water-filtration plant; reconstruction of sewers in South-Eastern district; new effluent and steam-water outfall from sewage farm; new carriers at sewage farm; wood-block paving—London-road; reconstruction of outfall sewer to Barn sewage farm; cleaning out of Pittville Lake; concrete piling, Dowdeswell reservoir landslide; and concreting floor of large service reservoir. No definite undertaking has been given to carry out any of the above work, but there is no doubt that some of the most pressing will have to be put in hand when more normal conditions prevail. Owing to the shortage of team labour, an electric vehicle is being purchased for the removal of house refuse. It is also proposed to purchase a tractor for hauling tar-macadam, the necessary trailers having been already obtained. The war does not appear, on the whole, to have so prejudicially affected Cheltenham so much as many other towns. Being a residential and health resort, it has attracted many residents, and the town is fairly prosperous. The corporation have continued to cater for visitors by giving first-class daily concerts during the winter, and the usual outdoor entertainments in the summer. A great response has been made by the townspeople with regard to voluntary help in connection with the war. Eight Red Cross hospitals have been established, and are continuously occupied by about 1,000 wounded men.

Chepstow (Mr. WILLIAM TURNER, surveyor to the rural district council).—Owing to economic considerations, the roads have lapsed into a very bad condition, and it will be necessary eventually to strengthen them by putting in good foundations.

Chiswick (Mr. EDWARD WILLIS, ASSOC.M.INST.C.E., F.S.I., F.R.SAN.I., engineer and surveyor to the urban district council).—During the past year practically no capital expenditure has been incurred, but minor improvements have been carried out at the sewage disposal works, including the laying of about half a mile of 2-ft. gauge portable railway, the construction of 11-h.p. motor tractor for the same, and the fixing of a clinker tar-macadam mechanical mixer. It is doubtful if any permanent improvement works will be carried out during the continuance of the war, but the following is a list of works which have been approved by the council for submission to the Local Government Board, and it is hoped that some, if not all, will be started immediately after peace is declared: The erection of a new wharf, retaining walls, locomotive crane, and portable railway, at or near the river depot; the provision of a river embankment, and promenade 100 ft. wide, from the present sewage disposal works at Chiswick to the Polytechnic Boathouse at Grove Park, including a sunken portable railway for conveying raw materials to factories, and raised tennis courts and gardens, facing the river. The provision and laying out of a pleasure and recreation ground at Strand-on-the-Green; the removal of the present old properties adjoining Kew Bridge, and the provision of a new approach road to Strand-on-the-Green and Kew Draw-dock; the wood-paving of Heathfield-terrace and Wellesley-road to form a by-pass to the Great Western Road; the wood-paving of Turnham Green-terrace to link up the wood paving of Bath-road with Chiswick High-road. The improvement and widening of Sutton-lane, for which Parliamentary powers have already been obtained; the general improvement and widening of Strand-on-the-Green, for which various properties have already been purchased; the laying out and completion of the existing burial ground; the erection of the motor-wagon shop, and facilities for the changing of different bodies.

Colne (Mr. T. H. HARTLEY, borough engineer and surveyor).—The construction of new works entailing expenditure is still held up, owing to the restrictions of the Local Government Board. The staff of the borough engineer and surveyor's department is still more depleted than even last year, owing to all men of military age having joined His Majesty's Forces. Some over military age have joined the new Roads Battalions in France, and those who remain are executing the ordinary routine work. Steady progress is meanwhile being made in the new town planning scheme for 877 acres of the borough. The authority of the Local Government Board has been obtained to proceed with the further stages. Plans and estimates are completed for the construction of further percolating beds at the sewage works, and when the restrictions on public expenditure are withdrawn a start will be made on the works proposed. A scheme long overdue for the duplication of certain main intercepting sewers is well in hand. The ordinary maintenance and construction of tar road surfaces is being proceeded with as far as the limited supply of labour will permit. Steps are being taken for the letting-off of certain parts of the recreation grounds to allotment holders for the increase of the food supply, principally potatoes and other vegetables.

Coulsdon and Purley (Mr. ROBERT CHART, M.I.M. AND CO.E., surveyor to the urban district council).—Unless the war is over it is not proposed to carry out anything not absolutely necessary. The surveyor has prepared a schedule of works to be undertaken after the war, including sewer extensions, £3,349; surface-water outfall scheme, £25,000; making up of private streets, £29,840; and highway improvements, £5,968.

Croydon (Mr. GEORGE F. CARTER, M.INST.C.E., borough engineer, surveyor, and water engineer).—The Local Government Board have agreed to the completion of a part of the works in hand at the South Norwood sewage works. These include the bringing into operation new sedimentation tanks, sludge pumps, and mains. Letters have been addressed to the owners of nearly 100 acres of unoccupied lands for use as allotments during the war, and these are being pegged out and allotted. At the Beddington sewage farm a large area of land is being specially dealt with for cultivation, and a motor plough has been purchased in connection with the work.

Doncaster (Mr. F. OSCAR KIRBY, M.SC., ASSOC.M.INST.C.E., borough surveyor and water engineer).—It is proposed during the present year to continue the carrying out of street improvement work in one or two special cases. A considerable amount of renewal of tramway track is to be undertaken, together with the experimental reconstruction of some highways. The preparation of an extensive housing scheme is also engaging the attention of the corporation. On the termination of hostilities it is proposed to proceed with the sewerage and sewage disposal scheme, street improvement schemes, additions to the refuse destructor, and various other proposals of less importance.

Droitwich (Mr. HY. HULSE, M.I.M. AND CO.E., borough engineer and surveyor).—The tar-painting of road surfaces will be about the only special work to be carried out this season. The projected works after the war include the cleaning and deepening of the section of the river Salwarpe situate in the borough and the provision of additional working-class dwellings, which will probably be the first works to be put in hand.

Dublin (Mr. MICHAEL J. BUCKLEY, borough surveyor and waterworks engineer).—The rebuilding of the destroyed area in the city, which will, it is anticipated, be carried out by the property owners concerned as soon as the Government deals with their claims for compensation, is the most urgent work of the future. In conjunction with this work the corporation propose carrying out some street widenings in the streets abutting on the destroyed property, and for which a unique opportunity has now arisen. The next important work to be carried out will be that connected with the housing of the working classes. The corporation have negotiated successfully with an American syndicate for a loan of £250,000 for this purpose, and, as the Local Government Board have sanctioned the borrowing of £84,000 of this amount, the most immediate schemes will now be pressed forward, and others taken up later on when the board sanction the balance of the loan. Next in importance comes the construction of the new storage reservoir at Roundwood (£134,000 loan), in connection with which more than half the work has been carried out. The council have various other works in view, but, owing to the impossibility of obtaining money to carry them out, there is no chance, so far as can be seen, of dealing with them during the ensuing financial year. As to the chief works in contemplation on the termination of the war, the most urgent will be the housing of the workers. An important engineering work will be the completion of an extensive main drainage system, which has already cost about £600,000. A few small portions remain to be finished, amounting to about £30,000. Among other schemes which may come before the council is a proposal to construct a bridge across the Liffey to replace the present unsightly metal structure (toll bridge), the lease of which has recently fallen in to the corporation. This proposal would be in line with the scheme, already decided on, for the widening of Liffey-street, leading from this bridge up to Henry-street, one of the leading business centres in the city. The erection of public baths and wash-houses for the north side of the city is also proposed

Dundee (Mr. JAS. THOMSON, city engineer).—There is no intention of entering upon any extensive works during the war, but preparations are being made for the commencement of many important works at the termination of the war, with a view mainly to giving work to men returning from the Front. These works include business premises at High-street, under the central improvement scheme; housing schemes; erection of phthisis pavilions at King's Cross Hospital; the completion of improvement at Seabraes; the erection of observatory on Dundee Law, and a [illegible] road leading thereto; and the erection of a baby clinic at Constitution-road. The aggregate estimated cost of these works is £200,000.

Dunfermline (Mr. P. C. SMITH, burgh engineer).—The coming year promises—as the past—to be one of exceptional activity. The Naval Base at Rosyth is within the city area, and for the provision of housing accommodation for the dock employees a large building scheme is now in progress. Over 600 houses are either occupied or in the course of completion, while an additional 1,000 houses will be constructed during the year. To meet this development the city is extending its water and gas services, forming new and widening existing roadways, involving an expenditure of £40,000. Apart from the works in the Rosyth area, the town council do not contemplate any scheme of magnitude or importance.

Durham (Mr. J. T. PEGGE, P.A.S.I., city surveyor).—The council have suspended as much work as possible, and the shortage of cartment and labour is acute. A wise policy has been adopted in view of more strenuous times ahead. Money unspent on public works has been invested in War Bonds, being thus kept in reserve. Beyond about £2,000 to be spent in remaking roads affected by abnormal motor traffic, a small street widening, a new urinal, the necessary part of a set of conveniences and shelters at the Wharton Park, temporary shelters for motor-'bus passengers, necessary sewerage works and replacements, and allotments for food purposes, it is not intended to do more.

Dursley (Mr. J. G. WENDEN, clerk to the rural district council).—The council have in view the execution of the following works at the conclusion of the war: The provision of a water supply for the parish of Cam; works of sewerage and sewage disposal for the parish of Kingswood; the completion of a scheme of sewerage and sewage disposal for the parish of Wotton-under-Edge, which was approved by the Local Government Board before the war broke out; the erection of working-class dwellings at Wotton-under-Edge, for which a site has been purchased; and the provision of a new burial ground at Wotton-under-Edge, for which an option for the purchase of a site has been acquired.

Eastbourne (Mr. W. WALKER, surveyor of highways to the rural district council). Hampered as the council have been by the extreme difficulty of obtaining material of any description, the highway work has been carried on on very modest lines, and it is not anticipated that any advance will be made during 1917. Generally, the policy of the council will be to preserve intact as far as possible. More tar-spraying will probably be done than usual, and local material utilised where available. Several sections of road have been seriously damaged by military traffic, but in each case adequate reparation has been made for the time being, and the work is proceeding. As regards works in contemplation for after the war, nothing definite has yet been decided upon; but schemes of road widening and drainage are under consideration on the Seaford side of the district, and it is hoped that the new coast road between Eastbourne and Bexhill may then be proceeded with. There should be no scarcity of work in the district.

Exeter (Mr. THOMAS MOULDING, M.INST.C.E., city engineer and surveyor).—So far as at present known no work will be carried out during the year other than ordinary routine work. Should peace be declared, it is possible that some of the work which has been deferred because of the war will be continued.

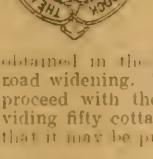
Gillingham, Kent (Mr. JOHN L. REDFERN, borough engineer and surveyor).—Should the war terminate during the ensuing year, the council intend to put in hand a considerable number of works which have been laying up, namely: The construction of a 36-in. storm-water culvert through H.M. dockyard, the diversion of the Pier-road intercepting sewer, and the widening of Park-road and Woodlands-lane, and making up a number of private streets. Until peace is declared work will consist of maintenance. About 40,000 gallons of deodorised tar will be used for surface spraying. A new plant for making tarred stone is being installed.

Glasgow (Mr. THOS. NISBET, ASSOC.M.INST.C.E., master of works and city engineer).—It is considered unlikely that any works of importance will be proceeded with until after the war, in view of the policy of the corporation to restrict all unnecessary expenditure, and of the difficulty in obtaining the necessary labour and material. There is no doubt that at the termination of the war a number of works will require to be undertaken in connection with street widenings, hospitals, halls, and baths and wash-houses.

Godmanchester (Mr. C. MAYFIELD, borough surveyor).—The best after-war work that could be undertaken would be to dredge the gravel beds out of the river, which at present form a great obstruction, and also to resurface the roads which run roughly parallel with the river with concrete, using either tar or cement as a binder, preferably cement.

Gosport and Alverstoke (Mr. HERBERT FROST, engineer and surveyor to the urban district council).—No special work is contemplated to be carried out during the current year beyond really necessary routine work. Definite schemes are in abeyance, among the most pressing being a new ferry landing, Gosport—Portsmouth, which includes a brow and pontoon to replace the old masonry "Haid"; a new road connecting Forton with Hardway; making up a number of private streets; scheme for new sewers and connections for houses to sewage system; renewal of destructor cells; increasing steam-engine power at the air-compressing station, augmented with gas engines; completion of a joint small hospital; and laying out and improving new recreation grounds, &c. It is not anticipated that, pressing as some of these items are—some of them have already received the provisional approval of the Local Government Board—any of these works will be actually taken in hand until after the termination of the war.

Grantham (Mr. J. H. DIXEY, M.INST.C.E.L., M.INST. MUN. AND C.E., M.R.SAN.I., borough surveyor). There are no special works contemplated in this borough beyond the maintenance and repairs to highways, which are being very badly damaged by the extraordinary military traffic. The estimated expenditure on main roads is £4,392 for the year ending March 31, 1918.



Grays (Mr. ARTHUR C. JAMES, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—Work in this district is at present entirely confined to necessary routine matters. Works to be undertaken at the close of the war include surface-water drainage, for which Local Government Board approval was obtained in the Spring of 1914, and a considerable road widening. The council have also resolved to proceed with the preparation of a scheme for providing fifty cottages, or more as may be required, so that it may be put into operation as soon as possible.

Crimsby (Mr. H. GILBERT WHYATT, M.INST.C.E., borough engineer and surveyor).—The only work which is likely to be proceeded with during the current year is the construction of the tuberculosis dispensary, with maternity and children's clinic adjoining. The contract has been secured by Messrs. Hewins & Goodhand, and orders to proceed with the work are being issued this month. Many other schemes are held over until the termination of the war, including the middle length of the Weelsby-road improvement, together with the bridge underneath the Great Northern Railway; the construction of sewers in the Ainslie-street district; the extension of the electricity works; the paving with granite of certain streets where the traffic is too heavy for tar-macadam; the carriage bridge over the Great Central Railway at the Central Market; a bridge (probably on the Scherzer rolling principle) over the Alexandra Dock at Corporation-road; an elementary school in Victoria-street North; a shelter and refreshment room in the Bradley Wood; an additional gallery in the Free Library, as well as other minor works.

Hailsham (Mr. G. B. FAIRCHILD, A.R.SAN.I., highway surveyor to the rural district council).—Owing to difficulties in obtaining sufficient metal for ordinary road repairs, the council, at present, anticipates little beyond ordinary maintenance. The damage by military traffic to the Eastbourne to Hastings road, in the parish of Hooe, will be made good by resurfacing and tarring, at an estimated cost of about £1,200, towards which the Road Board will contribute £720.

Halesowen (Mr. G. SPURR, engineer and surveyor to the rural district council).—In response to the Local Government Board's inquiry as to works which are needed for the area within the council's jurisdiction, and which might be undertaken by them on the conclusion of the war, the following suggestions have been made: Twenty-five road widenings; three new thoroughfares; 40,000 super. yds. footpath paving; new council depot and stables, with possibly refuse destructor; and a housing scheme. The district is of such a character as to make many improvements desirable, especially having in view the council's ultimate aim of obtaining unifying urban powers for the whole of their area. The carrying out of such a number of constructional works would, however, involve heavy expenditure. Seeing that expenditure of this nature would be undertaken (if at all) mainly because of the anticipated unsettled condition of labour throughout the country at the end of the war, and would thus be of State rather than local importance, it would have to be clearly ascertained, before making any commitments which would unduly hamper the financial resources, that the proposed outlay would not be entirely regarded as devolving upon the council as a local authority, but would merit, as to finance, weighty concessions from the National Exchequer.

Herefordshire (Mr. G. H. JACK, M.INST.C.E., M.S.A., county surveyor).—The energies of the roads department of the Herefordshire County Council will be taxed to the utmost in an endeavour to restore the highways to the good condition which they had reached prior to the war. There were 474 roadmen engaged in the county in 1914. At the end of 1916 this number was reduced by one-half. This, together with the difficulties of obtaining material and the scarcity of hauliers, has perforce reduced the expenditure from £44,097 in 1913-14 to approximately £35,000 in 1916-17. The requirements of the roads in twelve months' time will not be far short of £50,000 above the normal pre-war expenditure. The work of strengthening the trunk roads, with the assistance of the Road Board, which was commenced in 1913, will, it is hoped, be finished during this year, in spite of the war. The rebuilding of several small bridges will be undertaken as soon as cicumstances permit. The construction of two new schools and repairs to many existing school buildings will also be proceeded with.

Hessle (Mr. WILLIAM COULSON, surveyor to the urban district council).—In present circumstances the works to be undertaken by this council will only be slight during the present year. The works to be undertaken will be a moderate amount of tar-spraying, two or three small works of road widening, and the cultivation of certain land for the production of food. With regard to works to be undertaken after the war, the following may be included: Road widening in several parts of the district; an improvement scheme in the centre of the town, clearing away a considerable amount of old property; improvement of recreation ground; the provision of working-class dwellings; and the asphalting of a considerable length of footpaths in the district not now so paved.

Heywood (Mr. JAS. B. NUTTALL, borough surveyor).—Only absolutely necessary maintenance works will be undertaken by this corporation during the ensuing twelve months. On the termination of the war the chief works to be undertaken, some of which are already in hand, but postponed, are: Reconstruction of main roads and improvement of secondary roads; private street improvement works; intercepting sewers and storm overflows; construction of new roads to outlying districts; housing and town planning scheme; laying out of Hopwood Recreation Ground; underground convenience and lavatories; extensions at the electricity works; new bridge over the river Roch; and the renewing of lengths of tramway track.

Hinckley (Mr. E. H. CRUMP, ASSOC.M.INST.C.E., surveyor and waterworks engineer to the urban district council).—It is intended to instal a centrifugal pump to deal with sewage at the sewage works, and lay about 1 mile of water main. After the war the erection of further workmen's dwellings, a new destructor, the widening of Castle-street, and extensions to sewers and water mains are contemplated.

Holland, Lincs, South Division (Mr. A. W. LLOYD, M.I.M. AND CO.E., surveyor).—The county council have approved an estimated expenditure of £6,500 in respect of the maintenance and repair of the main roads in this division. This sum includes surface tarring 30 miles of road by contract, tarring 20 miles of footpaths, and various road repairs.

Horsham (Mr. R. RENWICK, surveyor and water engineer to the urban district council).—No new works are contemplated either during the year or, so far as is at present known, upon the conclusion of the war.

Killarney (Mr. G. A. E. HICKSON, M.INST.C.E.I., engineer to the urban district council).—The council are about to carry out a small scheme for the disposal of storm water in order to relieve the sewers of the town, and also in connection with this to make some slight extension to the existing sewerage. The estimate for these works amounts to £600, and this is practically authorised by the Irish Local Government Board. The council obtained a loan of £6,500 for housing the working classes, of which there remains an unexpended balance of about £3,000, but this money will not be available until after the war.

Kiveton Park (Mr. FRANK HEWITT, F.S.I., engineer and surveyor to the rural district council).—During 1917 the only works likely to be attempted are as follows: New cells and boilers at Dinnington refuse destructor; small road improvements (two); new filter bed at Anston sewage works; tar-macadam and tar-spraying work; small water main extensions; the making up of a couple of private streets; the completion of Recreation-row 15-in. and 18-in. surface-water sewer; and a public mortuary at Dinnington. A number of important schemes, some of which have already been before the Local Government Board, are in abeyance until after the war, including the following: Sewage disposal works extensions, Dinnington (£5,000); private street works (20); bridge rebuilding; sewerage and sewage disposal works at Wales Bar, Waleswood, South Anston, West Thorpe, Harthill and Woodall; road improvements (12); depot buildings; privy conversions; artisans' dwellings; and sewage disposal works extensions, Wales (£3,400). Developments due to new colliery workings will probably necessitate the preparation of a town planning scheme for part of the district in the near future.

Leeds (Mr. W. T. LANCASHIRE, M.INST.C.E., city engineer and surveyor).—In response to an inquiry from the Local Government Board asking what work could be put in hand after the cessation of hostilities, the following statement was presented: Street improvements, £17,309; reconstruction of unhealthy areas, £25,464; private street works, £33,022. Sewerage, £26,146—only work in connection with military hospitals or munition works is being carried out at the present time. Works to be carried out by other departments of the corporation were included as follows: Electric lighting (Mr. C. N. Hefford; manager, electric lighting department), £418,000; sewage disposal (Mr. G. A. Hart, sewerage engineer), £178,000; central technical school (Mr. J. Graham, secretary for education), £154,000; tramway renewals (Mr. J. B. Hamilton, tramways manager), £50,000. The city engineer is engaged in preparing town planning schemes as follows: (1) Buckingham House; (2) Harehills, Roundhay and Crossgates; (3) Osmondthorpe; (4) Gledhow; and (5) Moortown. The sanction of the Local Government Board has been obtained to prepare schemes for Nos. 1, 2, 3 and 4 [illegible]

particulars have also been deposited for No. 5, but the Local Government Board inquiry has not yet been held. It is hoped to push forward these schemes, so that useful work may be provided after the war in the construction of new wide main roads or the widening of existing roads, if at any time the state of the labour market requires such provision.

Leicester (Mr. E. George Mawbey, M.Inst.C.E., borough engineer and surveyor).—It is not possible to state what works will be carried out during the present year, but the following are projected works, which were postponed owing to the war and the deferring of the sanction of loans—viz.: Seven small sections of tributary sewerage and trade water sewers, estimated cost £10,500; widening and sewering of Lutterworth-road, £2,000; widening of Welford-road, £3,800; new sanitary conveniences, £630; and storm-water sewage disposal scheme, £120,000. It has been decided to proceed as expeditiously as possible with the preliminary work for extensive town planning schemes, and it is already in an advanced stage.

Leigh (Mr. Percy Morris, A.M.I.M. and Co.E., surveyor and engineer to the rural district council).—The council intend to proceed with the following schemes during the year, in addition to the usual road works, of improvement and maintenance—viz.: Sewerage and sewage disposal works for the township of Culcheth; scheme for supplying the township of Astley with water from a borehole, and a new sewerage pumping scheme for Astley.

Lincoln (Mr. R. A. MacBrair, M.Inst.C.E., city engineer and surveyor).—Immediately after the declaration of war all proposed works were put on the shelf, the council being satisfied with finishing those they had in hand. Among the most important works under consideration were the town planning scheme, and the erection of some 800 workmen's dwellings. The council were also considering the inclusion of some outlying townships where a large number of houses were being erected; while they had in view additions to the electricity works and the public abattoir.

Llanfrechfa, Upper (Mr. M. R. Jones, surveyor, inspector and waterworks manager to the urban district council).—The roads in this district have been somewhat neglected in past years. The work of making up and the execution of certain improvements in connection therewith would have been commenced this year but for the fact that suitable macadam could not be obtained. A sewer about a mile in length is to be constructed immediately the necessary labour is available. Minor improvements will be executed to the reservoir, including the laying of a cast-iron main from a well to the reservoir. It is also proposed to fix in different parts of the district two pressure-reducing valves and waste-water detecting meters.

Llangollen (Mr. J. W. Hughes, A.R.San.I., surveyor, water engineer and sanitary inspector to the urban district council).—At present the council are not considering any large undertakings. For this year the only suggestion is for an open-air swimming bath on the side of the river Dee, for which the surveyor is preparing a scheme. As to work after the war, the proposal is to provide a new reservoir for water supply at a considerable higher level, so as to supply the houses on the hillsides, and thereby encourage the building of good residential houses. A preliminary scheme was prepared, just before the war broke out, by Messrs. Berrington & Son, of Wolverhampton, the estimated cost being about £15,000. This project now stands over until after the war.

Lochgelly (Mr. Alexander Lumsden, burgh surveyor and sanitary inspector).—Owing to the restrictions regarding expenditure no new works have been agreed to during the war. It has, however, been agreed to carry out several works immediately on the termination of the war. These include new outfall sewers at a cost of £2,751; new sewage purification works, £8,252; several new street improvements, £7,170; total, £18,173. Plans, specifications and schedules are at present in course of preparation for the whole of the foregoing works.

London, Camberwell (Mr. William Oxtoby, M.Inst.C.E., borough engineer).—In consequence of the restrictions in regard to expenditure, nothing will be undertaken unless it is absolutely necessary.

London, Finsbury (Mr. P. G. Killick, borough surveyor).—It is not anticipated that any extensive works will be carried out by the council during the present year. Several important schemes, including a rebuilding scheme on the Northampton estate and the Metropolitan Water Board offices, are hung up for the duration of the war. The paving renewals will also be kept down to the minimum.

London, Woolwich (Mr. J. Sutcliffe, borough engineer and surveyor).—The only work of any moment which it is intended to carry out in the near future is the repaving of a portion of Beresford-street with wood blocks, but only to the value of about £700. The borough engineer has received instructions to proceed, when opportunity affords, with the town planning of the borough, and with sheds for rolling stock at the various depots. Other works in contemplation are the resurfacing of Footscray-road, the widening of Bexley-road, and a scheme for a new sewer for the Nightingale-place district. In addition, a very extensive list of schemes that might be undertaken has been compiled at the request of the Local Government Board, as work after the war; but this schedule is merely an embryo at the present time.

Longford (Co. Longford).—Mr. Daniel Leary, engineer, states that this council have decided to provide for the following works after the war—viz.: The completion of the late scheme of labourers' cottages, comprising about fifteen houses at a cost of £140 each; the drainage of Ardagh burial ground, at a cost of £123; and sewerage works at Lanesboro', at a cost to be estimated. The council have only in hand such works as are found to be urgent, such as repairs.

Lytham (Mr. A. J. Price, engineer and surveyor to the urban district council).—Like most other places the works to be carried out at Lytham are dependent upon the duration of the war. So long as the war lasts the Local Government Board will prevent their being carried out, though the patriotism would also prevent the spending of money on municipal works of improvement when Imperial needs are so much more pressing. The list of works sent up to the Local Government Board, which are to be taken in hand when the war is ended, is as follows: Open-air bathing pool, promenade and marine lake, at an estimated cost of £30,000; electricity works, £30,000; assembly rooms, baths and public offices, £30,000; golf pavilion, £2,000; street improvements, £4,975; public conveniences, £700, and recreations grounds, £10,000.

Mansfield (Mr. Waude Thompson, Assoc.M.Inst.C.E., borough engineer and surveyor).—No works of any magnitude are proposed until the termination of the war. A sewer extension in Southwell-road, and the resurfacing of Sherwood-road with tar-macadam will be carried out, and the town planning scheme for the borough will be proceeded with. After the war a large amount of work will be imperative, including a housing scheme, new mixed school, technical school, extension to sewage disposal works, several street widenings in the centre of the town, and a large number of private street improvement works. The laying out of new cricket ground, central fire station, new town hall, and the extension of the refuse destructor are also in contemplation.

Market Harborough (Mr. Herbert G. Coales, Assoc.M.Inst.C.E., F.S.I., engineer and surveyor to the urban district council).—The council do not propose to carry out any public works during the year, but Mr. Coales is getting on with a town planning scheme.

Markinch (Mr. Robert W. Todd, burgh surveyor and sanitary inspector).—The town council's engineers have received instructions to prepare plans for an extension of the water storage, the work to be commenced immediately the war is ended. Ground has already been acquired for the purpose.

Middlesbrough (Mr. S. E. Burgess, M.INST.C.E., F.R.SAN.I., L.R.I.B.A., borough engineer and surveyor).—The following are the principal works which will claim attention during the year: The completion of the Snowdon road outfall sewerage scheme, which provides for the sectional drainage of a considerable portion of the borough. The total cost of the scheme is £60,000, of which half has been put in hand by the special sanction of the Local Government Board, at a cost of about £32,000. This work is nearing completion. It is expected that the pumping station, together with the large main interceptor sewers, will be in operation by early summer. A scheme for the treatment of venereal diseases has been inaugurated, and the borough engineer has been instructed to go into the matter and prepare alternative proposals for hospital and administrative requirements in connection therewith. The after-war proposals for important arterial road construction are also in hand at the request of the Local Government Board, and estimates totalling upwards of £63,000 are being prepared, together with the necessary plans, so that the required consent may be obtained in order that, when possible, the work may be put in hand without delay. The maintenance and upkeep of the highways and footpaths, together with the main sewers, will, as far as possible in the circumstances of war time, be carried on as usual, and other business pertaining to this department of the corporation will be gone on with. The provision of land in suitable plots for cultivation under the Government scheme is also to be put in force at once.

Mitchelstown (Mr. PATRICK COUGHLAN, M.I.M. AND C.E., engineer to the rural district councils).—The projected works for the ensuing twelve months are the completion of the rural housing scheme and the water supply scheme—provision of wells and pumps, at an estimated cost of £1,000. The Fermoy Board of Guardians will undertake the completion of sanitation scheme for hospitals, at an estimated cost of about £1,500. The works intended to be carried out after the termination of the war by the Mitchelstown No. 2 Rural District Council include the provision of additional plots to labourers' cottages and the erection of additional cottages.

Morley (Mr. F. TURNER, B.SC., ASSOC.M.INST.C.E., borough engineer and surveyor).—During the early part of the year it is intended to extend considerably the plant for dealing with the sewage sludge. Apart from this, the work carried out will be routine work.

Newburn (Mr. THOMAS GREGORY, engineer and surveyor to the urban district council).—After the war two or three road widening schemes are to be undertaken, and also a further housing scheme.

New Malden, Surrey (Mr. REGINALD H. JEFFES, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—Owing to the restrictions imposed by the war no works are proposed to be executed during the year, except purely routine work, which, owing to depleted staff, is reduced to the lowest possible limits. The council have not yet considered what works they propose carrying out on the termination of the war. They have put the Cultivation of Lands Order in force in the district, and already about 20 acres of land have been applied for and allotted to various applicants. The council also propose to purchase seed potatoes for the use of allotment holders in the district. All this work has kept the surveyor's department in a state of considerable activity.

Northampton (Mr. ALFRED FIDLER, M.INST.C.E., borough engineer and surveyor).—It is very unlikely that any works will be carried out except such as are absolutely necessary, and the works which may have been projected will be postponed until after the war. This applies to the following works: Storm water and overflow relief sewers; Far Cotton sewage and surface water drainage, Kingsthorpe main drainage; and Houghton-road improvement.

Norwich (Mr. ARTHUR E. COLLINS, M.INST.C.E., city engineer).—In common with other towns, all work possible is being held up in Norwich, but certain schemes are under consideration, to be proceeded with at the close of the war, notably reconstruction of Carrow opening bridge across the river, and a riverside road from Carrow to Thorpe Station. The probable cost will be about £20,000. Work is now in hand for a gravel-washing and screening plant for the production of materials to be used for gritting tar-painting on carriageways and footpaths in place of using granite or other stone chippings, the cost of which, under the present circumstances, together with the difficulty of obtaining supplies, make their use almost prohibitive. Further, it is found that the local gravel, when properly washed and screened, is at least as satisfactory as the more expensive stone chippings. The closing of various refuse tips around the borders of the city is rendering imperative the consideration of a proper system of refuse disposal. It is likely this will take the form of the provision of four or five depots, to which the ordinary wagons will cart, there tipping into tanks, each holding not less than twelve cub. yds. Motor wagons (electric or otherwise, of 12 cub. yds. capacity) will be loaded from these tanks by the opening of bottom doors, and the vehicles will proceed with their loads to the point of disposal. Much of the refuse of the city is at present tipped on to marsh lands about 3 miles down the river, with very satisfactory results except from the point of view of cost. The provision of proper machinery for dealing with this would greatly reduce the cost, but, apparently, a modern destructor, having regard to the steam-raising power, would be cheaper than tipping on the marshes, even with the better facilities necessary. In the event of there being a real shortage of work after the close of the war, the flood reduction and navigation improvement works of the river would probably be quite sufficient to absorb all unemployed labour of this neighbourhood.

Oxford (Mr. W. H. WHITE, M.INST.C.E., city engineer).—The only special works at present in prospect are the completion of the reconstruction of the remaining roads on which the motor omnibuses run. The tramways have been already removed and the roads traversed by them, 10¾ route-miles, have been reconstructed during the past two years.

Penrith (Mr. W. S. LYTHGOE, highway surveyor to the rural district council).—The council's district covers an area of some 300 square miles, and has 430 miles of district roads. For the present the council have cut out all improvements, and are just carrying on the bare maintenance of their highways. They have under consideration the purchase of a portable power-driven rock drill to use in their various quarries to replace the slow and laborious system of hand-drilling. They also contemplate the purchase in the near future of a tractor and tipping wagons. During the year it is proposed to relay trial lengths of road, over which there is a medium amount of traffic, with tar-macadam, made with local limestone from the council's own quarries. The council have already put in water schemes in all their principal villages, and, naturally, sewages and disposal works are to follow. They had several of these schemes under consideration before the war, and the works no doubt will be carried out when things are normal again. The council have still several waths to bridge, and this work will be taken up after the war.

Portsmouth (Mr. ARTHUR W. WARD, ASSOC.M.INST.C.E., borough engineer).—There is no municipal work of importance now being proceeded with under the borough engineer's direction, except the extensions to the infectious diseases hospital, which is nearing completion.

Rochdale (Mr. S. SYDNEY PLATT, M.INST.C.E., borough surveyor).—All expenditure on new works of a permanent character is stopped by the Government. The staff of the borough surveyor, assistants and workmen is seriously depleted, leaving him barely sufficient assistance to carry on the routine work of the borough. The consideration of works after the war is suspended until

...is assisted as matters will then depend largely ... financial ... the country.

Risca (Mr. A. J. Davies, surveyor and engineer to the urban district council).—The council intend making ... streets in the earliest possible opportunity ...

Sandown, I.W. (Mr. Lester G. Dasher, M.I.M. and C.E., surveyor to the urban district council).—The council have under consideration many ... and important schemes to be carried out on the ... as soon as the war, but these are as yet in a ... stage.

Skegness (Mr. R. H. Jenkins, engineer and surveyor to the urban district council).—During the year the ... undertaking will be transferred to the ... under the Act of 1915, in accordance with the award of the arbitration tribunal. The council are to pay to the gas company annually a sum equal to 5 per cent. on the amount of the award until twelve months after the termination of the war, or such ... time as they may be allowed for borrowing the required amount. The costs of the council have been exceedingly heavy in acquiring this undertaking, which has involved the promotion of two Bills, opposition and arbitration, and the rates will have to bear a very considerable burden in order to repay short-term loans. In consequence of this and the war no ... will be carried out in new works during the ... although the usual amount of road surface will ... tarred. Certain private streets are to be ... after the termination of the war.

Stoke-on-Trent (Mr. A. Burton, M.Inst.C.E., F.S.I., borough surveyor).—At the present time, and during the continuance of the war only routine work will be ...

Street (Mr. William J. Goode, M.I.M. and C.E., surveyor and water engineer to the urban district council).—During the spring it is hoped to commence ... works in connection with the 9-in. cast-iron water supply main from the intake works, which is ... from external corrosion, owing to ... exceptional conditions across peaty ... Improvements to the highways will be ... and more extensively. The council are ... the erection of a public slaughter-house, and it is probable that an additional housing scheme will be put forward at the termination of the war. The ... of electric power in the new low-level pumping ... has proved a great saving and convenience ... the old engine.

Swanage (Mr. William H. Peachey, Assoc.M.Inst.C.E., engineer and surveyor to the urban district council).—The council have in view during the year the completion of a ... at Corfe Castle laying several ... of cast-iron pumping main, and the provision of pumping ... to supply Swanage and ... with water, subject to the necessary loan sanction being obtained.

Swinton and Pendlebury (Mr. Henry Entwisle, M.I.M. and C.E., M.R.San.I., engineer and surveyor to the urban district council).—Several important works ... been carried out in connection with the war. Sanction for ... has already been given by the Local Government Board for the following, and it is hoped that the ... will be proceeded with on the termination of the war. Works of sewerage, including the construction of ... brick culverts and pipe ... at an estimated cost of £10,000; the erection of ... houses for the working classes at an ... cost of £2,000. Works projected: Re-covering ... filter-beds and subsidiary ... existing sewage ... by extending ... during operations at an ... cost of £1,000; paving ... with concrete ... at an estimated cost of £1,000; completion of ... widening and reconstruction of Dean's-road, at an ... cost of £1,000; additions to refuse destructor ... by the provision of ... at an ... cost of £1,000.

Waterford (Mr. Cecil J. Lewis, engineer, surveyor ... to the urban district council).—The ... carrying out during the year any ... of importance at present ... the Local Government Board on the termination of the war the ... will probably include the following ... The lighting of the city by electricity; the paving of the quays by a part-grant from the Road Board; ... baths; the laying of 7 miles of cast-iron 15-in. diameter water mains to supplement the present water supply, together with the enlarging of the existing ... and filter area.

Wembley (Mr. Clem R. W. Chapman, engineer and surveyor to the urban district council).—Acting as the burial authority, it will be necessary for the council, by some means or other, during the ensuing twelve months, to prepare an area for burials, the present ground being almost completely filled. A field of 11 acres was purchased at the beginning of the war, and it is proposed to lay out 3 acres of this, enclosing the ground with wrought-iron unclimbable fencing, with suitable entrance gates, together with the necessary footways and surface drainage, also the widening and improving of an old bridleway which forms the only access to the site. Plans are being prepared by the engineer and surveyor to the council for submission to the Local Government Board. The provisions of the Cultivation of Lands Order, 1916, will be pursued vigorously. Numerous schemes, including sewage disposal works, destructor, disinfector, and public and private street improvements are being held over until the termination of the war.

West Bromwich (Mr. Albert D. Greatorex, M.Inst.C.E., M.S.A., borough engineer and surveyor).—Beyond maintaining the highways, tramways, and other works as far as possible under the restricted regulations as regards men, the council do not propose executing any other work this year.

Windermere (Mr. Charles E. Hines, M.I.M. and C.E., M.R.San.I., surveyor to the urban district council).—All works, other than maintenance, have been suspended for the time being, but the council contemplate carrying out the following works on the conclusion of the war: (1) The completion of the sewerage and sewage disposal scheme, which was commenced in 1913, but suspended in 1916, when nearing completion, owing to shortage of labour and materials; (2) the construction of a cottage for the manager at the new sewage disposal works, £633; (3) the widening of the Windermere-Patterdale main road, and removal of dangerous corners at Chapel Ridding and St. Catherines, £553; (4) the removal of dangerous corner on the Rayrigg-road at The Green, £207; (5) the resurfacing of portions of the Windermere-Bowness main road, £4,166; (6) the diversion of the Windermere-Kendal main road at Bannerrigg, £1,596.

Wombwell (Mr. Wm. Quest, surveyor to the urban district council).—It is not proposed to carry out any special work during the ensuing twelve months. Something, however, will have to be done to provide additional ground for the cemetery; but as land for this has already been acquired, it is only a question of enclosing part or the whole of this land for the purpose. There are several schemes to be put in hand as soon as possible after the war, including additions and alterations to New Scarborough sewage works, several new sewers, sewer extensions, new mortuary, and at least three road improvements.

Ystradgynlais (Mr. T. Watkins, surveyor to the rural district council).—The council do not intend carrying out many new works during this year, as a good bit of money will have to be spent in restoring the roads after the heavy traffic in connection with the sewerage scheme, and the cutting up of the roads throughout the district to lay the sewers. It is proposed to reconstruct Ainon Bridge, and to widen Craigmaespica-road, Cwmtwrch. After the war the water supply will have to be increased to meet the requirements of the sewerage scheme, and additional storage tanks erected; a new road will be constructed between Abercrave and Coelbren. A Provisional Order has been obtained to enable the council to purchase the electric lighting undertaking; but this cannot take effect until six months after the war.

Prosperous Brighton Tramways.—Traffic receipts on the Brighton Corporation tramways for the past nine months have increased by £5,700, which is a record in the history of the undertaking. It is the more remarkable as the previous year was an unprecedented success. The prosperity of the past summer season was one contributory cause of the advance, but the principal element was the large daily traffic among munition workers employed in the district.

LAND FERTILISERS FROM HOUSE REFUSE.

LIGHTNING DUST MANIPULATORS.

We are a conservative people. We needed a war of the first magnitude to force us to admit the necessity of cultivating our land to the fullest possible extent, and, as a corollary, the urgent need of fertilising this land of ours. But now potash and nitrates are scarce, the former coming from Germany, and freight for transport of the latter being prohibitive, and the motor vehicle has ousted stable manure. We have fertilising material in inexhaustible quantities in our very midst, the contents of our dustbins, our house and town refuse. But for years we have been the money necessary for erecting plants to reduce house refuse to manure. These difficulties notwithstanding, the Metropolitan Borough of Bermondsey managed during last year to erect a plant of four dust manipulators at their depot at Rotherhithe. The war has also caused a scarcity of money in our Colonies. Yet during the past twelvemonth two Lightning Dust Manipulators have been erected in Australia, one at Woollahra and the other at Paddington, both suburbs of Sydney, and one has been erected at Devonport, in New Zealand. A number have gone to South America, one having been laid down in the city of Campos, in Brazil, one at Ribeirão Preto, and others in other cities of the South American Continent.

With the urgent need for fertilisers, inquiries for

INSTALLATION OF FOUR PATENT LIGHTNING DUST MANIPULATORS.

(Recently erected by Bermondsey Borough Council.)

foolishly throwing it away, tipping it down exhausted quarries, barging it out to sea, burning it in our dust destructors.

Captain Furse, of the Patent Lightning Crusher Company, Limited, the inventor of the Lightning Crusher and Pulveriser, was the first pioneer of a great industry. His motto was, "Give back to the land what came from the land," and he strenuously and ceaselessly advocated the utilisation by the borough councils of all refuse for fertilising purposes. Under the name of "Dust Manipulator," a modification of this wonderful pulverising machine has been in use for some years now for reducing practically unsorted house refuse to a fertiliser specially adapted for heavy soil, of which a great majority of our land is composed.

The first to appreciate the advantages of this invention was Mr. Arthur Harrison, borough engineer and surveyor to the Southwark Borough Council, who courageously caused a plant of two machines to be erected at the Manor-place depot. Within two years the plant was doubled, and so satisfactorily did it work that the year before the war over 20,000 tons of house refuse were sold as manure to the farmers of Surrey and Kent. Halifax, Bispham-Blackpool, Hove, Glasgow, St. Andrews gradually and at intervals followed suit.

Still, a system that should have been adopted all over the land was limited to the capabilities of an enterprising and intelligent few. Now there is a cry for the cultivation of land, a cry for manure. But the corporation of Hove only last year was not allowed to quadruple its plant because the Local Government Board would not sanction the necessary loan! And theirs is not an exceptional case. Owing to the veto of the Treasury, councils could not raise dust manipulators are now pouring in, and the demand for these machines may be expected rapidly to increase.

"Back to the land!" is the motto now.

Successful Sewer Dredging.—The Eccles Corporation sewers and drainage inspector, Mr. James Caine, has just received accounts of successful cleansing operations by the use of his appliances in the towns of Grantham and Warrington. Mr. J. H. Drew, borough engineer and surveyor of the former town, writes: "On taking up duties here a few months ago, I found a section of 9-in. and 12-in. sewer leading from a large fellmongery and leather-dressing works badly choked, and was informed there was frequent trouble with this sewer, which had to be constantly dredged. You kindly loaned me one of your 12-in. to 24-in. sewer ploughs and cleansers, and after a short trial my committee decided to purchase them. The writer afterwards recommended that your smaller machines be sent on trial for the 9-in. section of sewer, and so well did these do the work claimed for them that my committee agreed to purchase these also. No less than 5 tons 12 cwt. 2 qr. of lime deposit and other refuse was removed from the 9-in. and 12-in. sewers in a very short time, these having a length of 3,500 ft. I can thoroughly commend your patent sewer plough and cleanser to my colleagues as the most efficient sewer dredging appliances I have yet seen on the market." The borough engineer and surveyor of Warrington, Mr. Andrew M. Ker, writes: "Your machines are doing good work in this town, and are a far greater improvement on any yet adopted. They are a great success, and this corporation has decided to purchase them."

ROAD MAKING MATERIALS AND APPLIANCES.

MANUFACTURERS' REPORTS FOR 1916.

In reviewing the past year, as far as the maintenance of our roads has been concerned, one is impressed with the importance of surface tarring, and the extent to which it has relieved the difficult situation caused by the shortage of materials and the demands for economy.

A great many roads have been preserved for another year solely by this comparatively cheap and simple expedient, and in spite of the shortage of labour and haulage, and the difficulty experienced in obtaining speedy deliveries of materials, Messrs. Johnston Brothers, of 79 Mark-lane, E.C., have successfully carried out all their contracts, and have treated some millions of super. yards by means of their patent jumble-furnace boilers with Waithman reservoir [illegible]. This system of tar-painting by hand has again proved an unqualified success, and in many districts where this work had been carried out in the previous year the surfaces were found to be almost as good as when first treated.

Although the difficulties of 1916 were great, those to be encountered in 1917 will be still greater; but the need for tar-painting will also increase, and Messrs. Johnston are taking energetic steps to enable them to carry out the contracts that may be placed with them in their usual speedy and efficient manner.

In addition to the above contract work, many county, city, borough, urban and rural district [illegible] have been supplied with these double-furnace boilers and Waithman apparatus, and excellent results have been achieved. One authority, in deciding to purchase a machine that had been sent on approval, stated that on the first day of working a speed of 1,200 super. yds. per hour was attained, and results still better are anticipated when the men get more accustomed to the work.

When a good surface has been obtained by tar-painting, it is economy to keep it good instead of allowing it to wear into potholes—which soon spell ruin—and for this purpose Smart's Midget patching outfit has proved very popular. One of our leading county surveyors who had some of these outfits stated that his only regret had been that he had not more of them. Needless to say, these regrets were soon dispelled by a further supply of Midgets.

There has been a great demand for the Welsh granites for which Messrs. Johnston Brothers are the concessionaires, and until quite recently all demands [illegible] but of late, owing to the heavy demands of the Road Board for materials for national purposes, some disappointment has been unavoidably caused [illegible] are doing their best to fulfil all contracts.

* * * *

It is a striking testimony to the merits of Messrs. R. S. Clare & Co.'s materials, and to the sound repute in which they are held by surveyors and authorities interested in road treatment generally, that the past season has yet again marked a big increase in sales over the already large figures attained in previous years.

Constructional work has of necessity once again [illegible] and motives of economy have called for an increase in the palliative treatment of existing surfaces. This has caused a yet greater quantity of Tarco to be required.

Bi-Tarco has again fully maintained its position as a standard binder, which it well deserves in view of its wonderfully adhesive qualities, due, it is claimed, to the [illegible] of pure bitumen and other [illegible] which it contains.

Messrs. Clare are, of course, also supply in very large quantities a special grade of Bi-Tarco to surveyors who prefer the grouting method of construction, and this material has largely been adopted for the construction of [illegible] roads, in which connection it has received enthusiastic praise.

It is well to mention that both Tarco and Bi-Tarco comply in every respect with the requirements of the High Explosives Department of the War Office.

Tarvalon Ointment and Paste has again found favour with gamekeepers and [illegible] employers [illegible] for [illegible] preparation for removing all the grease and grime from the hands, without the [illegible] effect upon the skin.

* * * *

Messrs. Thompson & Southwick, Limited, The Foundry, Tamworth, are manufacturers of the "Acme" patent rotary tar-macadam machines. They have, however, sold none for the year, as they have had to put them on one side for special work in which they are engaged.

The firm have a number of the machines at work in different parts of the country, and these are giving satisfaction. They have just received a report from one of the principal cities in this country in which one of their machines is being used, and this states that it is working in an entirely satisfactory manner.

The firm think there is not the least doubt but that there will be a big demand at the close of the war for this machine. It may be mentioned that they are manufacturing the machines either fixed or portable.

* * * *

Regret is expressed by Messrs. John Yates & Co., Limited, Aston Manor, Birmingham, at the recent decrease in road making, as it affects so many of their oldest friends; but, as it is generally admitted, it must of necessity be one of the first industries to recuperate after the war, "we hope," they say, "they may soon experience renewed prosperity." The firm are careful, so far as ever possible, to supply with a minimum of delay the requirements of such of their regular clients, both public authorities and contractors, as are doing any work, fully realising the great need they will have of their continued goodwill when peace is declared. Where they are compelled to claim their friends' indulgence as regards delivery, they endeavour to do so without giving umbrage by fully explaining the position, and so far have been met, without exception, with the greatest consideration, as everyone recognises the successful prosecution of the war as the paramount purpose of the day. The company have supplied considerable quantities of their manufactures in connection with military roads at home and abroad, and have been careful to make all possible arrangements here for coping to the best advantage with the great demands for the work they expect to arise at the close of the war.

* * * *

The Dussek Bitumen Company, Bromley-by-Bow, London, E., report that, although during the past year there has been a decrease in road making, a very satisfactory amount of work has been carried out with their "Trinidite" binder and "Bitite" grout for setts during 1916. They consider this has been due to the reliable work previously carried out with these materials, as not one of the sections laid with "Trinidite" have ever failed. On no single occasion, either, has it been necessary to relay any setts that have been grouted with "Bitite."

Both these materials have, the firm claim, been proved by practical experience to be the highest-quality materials of their kind on the market.

* * * *

The demand for the Ames' Patent "Adaptable" horse broom, manufactured by the Ames-Crosta Sanitary Engineering Company, Limited, 12 Victoria-street, Nottingham, has largely increased during the past year, owing largely to the extension of tar-spraying. This broom is now recognised as being one of the most efficient and economical for cleaning the surface of roads. Large numbers of these brooms are also being sent out to France for use on the existing roads and the new military and main roads under construction.

* * * *

Highways Construction, Limited, Finsbury Court, Finsbury-pavement, E.C., report that forty-one of their head office and depot staff have joined His Majesty's Forces, in addition to which four have been lent to Government Departments.

Owing to the war there were but few opportunities of securing contracts in 1916, but successful work has, however, been carried out at Barrow, Abertillery, Wolverhampton, and Kensington. Full advantage has been taken of the restriction on the execution of road-surfacing work to carry out research and experimental work, and the company looks forward hopefully to securing a large amount of work on the resumption of peace.

* * * *

During the past year the Anglo-Mexican Petroleum Company, Limited, Finsbury-court, London, E.C., have, notwithstanding the abnormal circumstances, maintained its imports and deliveries of Mexphalte and Fluxphalte for road making and industrial purposes. Mexphalte has now become so well known to surveyors and road engineers as a high-grade Mexican bitumen, that no further description need be given of it. Both for grouting and asphalt macadam construction it has proved entirely satisfactory wherever employed.

The development of Clinker-Mexphalte roadwork

has opened up a further prospect for its effective use, which promises to be considerably increased at the conclusion of the war.

Fluxphalte, the liquid bitumen for road surfacing, has also proved successful in use, its long life and durability as a dressing being a notable feature of this material.

* * * *

Messrs. Aveling & Porter, Limited, Rochester, inform us that their output of steam rollers, tractors, steam wagons, &c., has been much reduced during the past year, in consequence of the Government work which they have been called upon to undertake, and that only a portion of this reduced output has been available for the use of private customers. They are doing everything that the circumstances permit to supply new plant on order for road making work in this country, but, of course, their deliveries are limited on account of Government requirements, and are subject to the Ministry of Munitions classification of output.

* * * *

Messrs. Engert & Rolfe, Limited, of Poplar, have been wholly engaged in meeting war requirements for their special roofings, and asphalt work and road-work have played very little part in their year's activity. They are, however, pleased to say that road-work executed by them prior to the commencement of hostilities has behaved splendidly under most trying conditions of motor 'bus and military traffic, and expenses for repair have been conspicuous by their absence. The "Bituvia" system of asphalt-macadam grouted road crusts, specialised in by this firm, is stated to have justified all claims made for it. During the past year stretches were laid at Reading with most successful results.

Messrs. Engert & Rolfe, Limited, are working to their utmost capacity in an endeavour to meet the heavy demands made on them for materials for Government requirements, both direct by Government Departments or their contractors, for hospitals, huts, airship and aeroplane sheds, munition works of all kinds, stores, &c. Very large areas of asphalt work have been carried out, a considerable proportion in the special gritless asphalt in which this firm specialise, which ensures a sparkless floor, which is ideal for buildings in which explosives are manufactured or handled. The demand for their "Waterp" roofing (a "rubber" type self-finished roofing felt) has also been considerable, and over 10,000,000 sq. ft. were supplied for war purposes during 1916.

* * * *

In consequence of Government requirements, Messrs. Mann's Patent Steam Cart and Wagon Company, Limited, Hunslet, Leeds, were obliged during the past year to discontinue completely the manufacture of their light rollers and road appliances. The above holds good as regards motor vehicles also, except that in a number of cases the firm have built wagons to replace motors or horses which have been requisitioned by the authorities or for other special purposes.

* * * *

During the past year Tarmac, Limited, Ettingshall, Wolverhampton, have been to a very large extent engaged on the supply of Tarmac for important military work at the various military camps and depots, aerodromes, national factories, and so forth, the work being undertaken by the Road Board, acting for the military authorities. Preference has, of course, had to be given to work of military importance, and as a consequence there has been considerable delay and disappointment with supplies for the company's ordinary customers. The company acknowledges with gratitude that the various county councils and local authorities whom the company have been obliged to disappoint and put off have very kindly accepted the situation and agreed that absolute preference has been necessary to work of military importance.

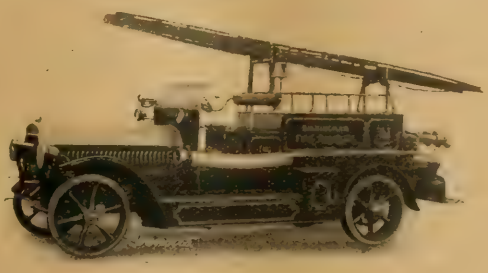
During the year 1916 the new works at Brymbo, near Wrexham, have been completed and put into operation. The company has now therefore three works in operation—viz., at Ettingshall, Wolverhampton; Denby, near Derby; and Brymbo, near Wrexham.

The new works in another town, despite delays caused by war conditions, would have been completed and available for the supply of Tarmac in the North of England for 1917-18 contracts, but the Road Board have taken these works over entirely for important military work, and until the works are released to the company again no material can be supplied from Middlesbrough to county councils or local authorities

PUBLIC SERVICE VEHICLES.

DENNIS BROTHERS' SPECIALITIES.

Messrs. Dennis Brothers, Limited, of Guildford, have the distinction of being the oldest established firm of motor manufacturers in Great Britain, and in the wonderful record of success that has always attended their productions, vehicles in municipal service play no inconsiderable part. This, indeed, is only what might be expected with a firm that has been so closely associated with the most notable developments in connection with self-propelled fire appliances. The turbine motor-pump fire engine, now an adopted standard almost everywhere, is essentially a Dennis speciality, for it was by the enterprise of Messrs. Dennis Brothers, Limited, that—like another well-known innovation, the worm-drive—it was first introduced. Since then many scores of these machines have been acquired by corporations, public authori-



DENNIS TURBINE MOTOR-PUMP FIRE ENGINE.

ties, and Government and other establishments throughout the world. Nearly all of the large fleet of motor-pump fire engines operated by the London Fire Brigade are of Dennis build, and of the total of about 150 vehicles of all kinds used by that organisation more than two-thirds have come from the famous Guildford factories. The machine shown in the illustration is a standard type as supplied to the Birmingham Corporation, being of 60 h.p., and having a pumping capacity of 400 gallons per minute, with a road speed of nearly 40 miles an hour.

In various other directions, too, Messrs. Dennis Brothers, Limited, have made a special feature of vehicles intended for public services, and the side-tipping lorry, also illustrated, is only one of a very large number of public service lorries of every possible type—omnibuses, prison vans, street-cleaning vehicles,

DENNIS SIDE-TIPPING MOTOR LORRY.

tower-wagons, &c.—built in the Dennis works, and distributed among more than a hundred county and municipal councils in this country and overseas.

For some considerable time past the whole of Messrs. Dennis Brothers' output, which has very considerably increased since the war, has been taken by the Government; nevertheless, due preparations are already being made for a return of more normal conditions, and in the firm's future plans it will be found that careful study has been made of the needs of municipal engineers. It is recognised that their requirements are quite distinct and apart from those of ordinary commerce, and that the municipal vehicle of the future must be specifically designed for its work, and readily adapted to varying purposes. In due course it will be found that Messrs. Dennis Brothers, Limited, have dealt with this particular problem with their characteristic resource and thoroughness.

The Legal Precedents of 1916 in Relation to Municipal Engineering.

By J. B. REIGNIER CONDER, a Solicitor of the Supreme Court.

During the past year questions have been decided by the Courts in connection with claims for damages against local authorities, contracts, highways and bridges, isolation hospitals, workmen's compensation, and waterworks. Among the localities concerned were Abingdon, Baslow, Beverley, Chertsey, Crouch End, Derbyshire, Halifax, Hornsey, Liverpool, Leiston-cum-Sizewell, Marylebone, Oxford, Ramsgate, Rawtenstall, and Teddington. Among the statutes considered were the Highways and Locomotives Amendment Act, 1878, the Riot (Damages) Act, 1886, the Isolation Hospitals Acts, 1893 and 1901, the Public Authorities Protection Act, 1893, the Rawtenstall Corporation Act, 1907, and the Defence of the Realm Acts. Of the cases noted five are decisions of the House of Lords, three of the Court of Appeal, eight of the King's Bench Division, and one of a County Court.

Claims for Damages.

In *Andrews* v. *Ramsgate Corporation* (vol. xlix., p. 284) the proprietor of the Paragon Baths, Ramsgate, claimed damages against the corporation for alleged injury to his business and premises. The corporation had begun to construct a concert-hall and Italian garden on the cliff adjoining the baths, and had excavated a quantity of chalk, which was thrown over the cliff, forming a heap in front of the baths. Mr. Justice Lawrence gave judgment for the corporation, on the ground that, although the plaintiff might have the right to take water across the foreshore, that gave him no claim against the corporation, who were not the owners of the foreshore.

In *Baldwin and Partners, Limited*, v. *Halifax Corporation* (vol. xlix., p. 657) the plaintiffs claimed damages for injury to their goods by flooding, during an exceptionally heavy rainfall. It was contended that the corporation had been guilty of negligence in the construction and maintenance of certain roads, catchpits, and sewers. Mr. Justice Atkin held that no negligence was proved with respect to the sewers, but that there had been negligence both in the construction and maintenance of the roads and catchpits, and he gave judgment for the plaintiffs for £500, being the amount at which it was agreed that the damages should be fixed in the event of the corporation being held liable.

In *Place* v. *Rawtenstall Corporation* (vol. l., p. 217) the corporation gave notice to the plaintiff to convert his pail-closet into a water-closet, and to connect same with a sewer. The notice not having been complied with, the corporation did the work themselves, for which purpose they constructed a combined drain to carry the sewage of the plaintiff's house and several other buildings, at a total cost of £54, of which the plaintiff's share was £11. He refused payment, on the ground that, in the carrying out of the work, his house had been injuriously affected by subsidence, for which he claimed damages. The matter was referred to arbitration, and the arbitrator awarded the plaintiff £46 damages, with costs. The corporation, however, denied liability, on the ground that, under sec. 257 of the Rawtenstall Corporation Act, 1907, they were not liable (in the absence of negligence) to pay any damages consequent upon the execution of work done "in default of the owner." But it was held by the Court of Appeal (affirming Mr. Justice Ridley) that, inasmuch as the work done included more than that which the plaintiff was required to do by the notice, the section did not apply, and the corporation were liable.

Contracts.

In *Leiston Gas Company* v. *Leiston-cum-Sizewell Urban District Council* (vol. xlix., p. 155) the company contracted with the council to erect and maintain gas lamps and standards in the streets and to supply gas for lighting the same. The contract was to remain in force for five years certain from August 1, 1911, being determinable by six months' notice, expiring July 31, 1916, or July 31st in any subsequent year. In consequence of an Order of the military authorities, under the Defence of the Realm Acts, only twenty-six lamps were lighted from January 1 to January 26, 1915, and none during the remainder of the year. The company, however, claimed for three quarterly payments to March 31, June 30, and September 30, 1915. Mr. Justice Low held that the contract was not determined, nor its performance made unlawful or impossible, by the Order of the military authorities, and that it was impossible to say how much of the charge was deferred payment for furnishing plant, and how much for gas consumed. He therefore gave judgment for the company for the amount claimed. This decision was affirmed by the Court of Appeal.

In *Metropolitan Water Board* v. *Dick, Kerr & Co., Limited*, the defendants, in July, 1914, contracted to construct some reservoirs for the board. The work was duly commenced, and was continued until February, 1916, when notice was served on the defendants by the Minister of Munitions requiring them to discontinue the work, and to comply with the requirements of the Ministry with regard to the plant and labour at their disposal. The work was accordingly stopped, and some of the plant was disposed of in accordance with the instructions of the Ministry. It was held by Mr. Justice Bray (1) that the contract was not abrogated; (2) that under the terms thereof the plant, on its arrival at the site, became the limited property of the board; but that (3) the defendants were not bound to repay the money received for the plant sold, inasmuch as they were acting as agents for the Ministry of Munitions. But he granted an injunction restraining the defendants from removing or receiving the proceeds of sale of any machinery except under the order of the Ministry.

Highways, Streets, and Bridges.

(*a*) ACCIDENTS.

In *Crane* v. *South Suburban Gas Company* (vol. xlix., p. 134) the company's workmen, while repairing a gas main in a public highway, left some molten lead in a ladle, which was placed in a fire-pail on a piece of ground, adjacent to the paved footway, on which the plaintiff (a young child) and other children had been playing. A passing boy accidentally knocked the pail over, and some of the molten lead was spilt on the plaintiff. It was held that the company were liable in damages for the injuries to the latter.

In *Hewlett* v. *Great Central Railway Company* (vol. xlix., p. 471) the company were authorised by a special Act of Parliament to maintain gates and posts at the entrance to their Marylebone station. The Act did not expressly impose on them any duty to light the place. The lighting of the street was carried out by the Marylebone Corporation, but by Regulations under the Defence of the Realm Consolidation Act, 1914, the lighting of the approach was so diminished that the plaintiff, a taxicab driver, failed to see one of the posts, and drove his cab into it. The case was tried by Mr. Justice Darling and a special jury, who awarded the plaintiff £50 damages. This decision was affirmed by the Court of Appeal, who held that the special Act did not absolve the company from the duty to act with reasonable care for the safety of the public, in the circumstances which might from time to time be existing. The House of Lords, however, allowed the company's appeal.

In *Turner* v. *Coates* the defendant was a farmer, and had occasion to transfer an unbroken colt from one farm to another. A boy was leading it along a highway connecting the two farms, the defendant following. The plaintiff (a nurse) was riding a bicycle on the road, and, the colt taking fright at the bicycle lamp, dashed across the road and knocked her over. It was held by the King's Bench Divisional Court (affirming a County Court judge) that the defendant was liable in damages, on the ground that an unbroken colt is likely to be dangerous on a highway, and sufficient care must be taken to prevent its doing damage.

(*b*) EXTRAORDINARY TRAFFIC.

In *Abingdon Rural District Council* v. *City of Oxford Electric Tramways, Limited* (vol. l., p. 455), judgment was given for the council for £350 for extraordinary expenses incurred in repairing two roads between Oxford and Abingdon, in consequence of damage done by the company's motor omnibuses between September 28 and October 4, 1915, during which period 135 omni-

buses had used the roads, the other motor traffic of comparable weight consisting of eleven covered motor vans, eight motor lorries, and two traction engines with trailers. It was contended on behalf of the company that a service of omnibuses run to serve the needs of a district could not be extraordinary traffic. They also denied the damage, and alleged that the roads had not been properly maintained.

In *Beverley Rural District Council* v. *Walker* (vol. l., p. 532) the surveyor's certificate contained no reference to any expense, average or otherwise, of repairing highways in the neighbourhood, with the result that the council's claim for £500 for extraordinary traffic expenses failed, and judgment was given for the defendant with costs.

(c) REPAIR OF RAILWAY BRIDGES.

In *Attorney-General* v. *Great Northern Railway Company* the House of Lords affirmed the decision of the Court of Appeal reversing that of Mr. Justice Warrington (noted in vol. xliv., p. 1059). The point at issue was the extent of the company's liability to repair the bridge carrying the highway from Hornsey-road to Crouch End over their line. Mr. Justice Warrington thought that the standard of repair was on the basis of the present-day traffic, but both the Court of Appeal and the House held that the standard was to be fixed according to the traffic that might reasonably be expected to use the bridge at the time of its construction. It will be remembered that, as regards canal bridges, an "up-to-date" standard of repair was fixed in *Attorney-General* v. *Sharpness New Docks, &c., Company* (vol. xlv., p. 234).

Isolation Hospital.

The decision of the Court of Appeal in *Attorney-General* v. *Derbyshire County Council* (referred to in vol. xlix., p. 124) was affirmed by the House of Lords (vol. l., p. 149). This case had reference to an isolation hospital established in 1897 for the Haddon Joint Hospital District by order of the county council, which order determined the representation on the committee of the county council and the local authorities within the united district, including (among others) the Baslow Urban District Council. In 1914 differences of opinion arose between the latter council and the county council on questions of policy. The county council thereupon made an order altering the constitution of the committee by increasing the number of their own representatives from two to nine, and reducing that of the urban district council to half a member, thus giving the county council such an absolute majority on the committee that they could entirely control its policy. It was held that, subject to their directly contributing to the hospital funds, the county council had power to vary the representation in the way they had done.

Public Authorities Protection.

In *Kauffmann Brothers* v. *Liverpool Corporation* (vol. xlix., p. 471) the plaintiffs' premises were damaged by riots, and they made a claim against the corporation under the Riot (Damages) Act, 1886. The corporation made an offer, which was refused, and more than six months later the plaintiffs commenced an action. The corporation pleaded the Public Authorities Protection Act, 1893, which limits the time for the commencement of proceedings in respect of any act, neglect or default in pursuance or execution of any Act of Parliament, public duty, &c., to six months after the act, &c., complained of. But it was held that this was not a claim for damages for any "act, neglect or default" within the meaning of the Act, and the decision of a County Court judge in favour of the plaintiffs was affirmed.

Waterworks.

In *Metropolitan Water Board* v. *Chertsey Union Assessment Committee* (vol. xlix., p. 156) it was held by the House of Lords that, in assessing to the poor-rate a piece of land on the bank of the river at Walton-on-Thames, used by the board as an "intake," no "enhanced value" ought to be put upon the land on account of its "special fitness" for the purpose for which it was used; but that, on the other hand, no reduction in the usual basis of assessment (viz., 4 per cent on the piece of land and 5 per cent on the cost of buildings) should be made owing to the board being able to borrow at less than 4 per cent.

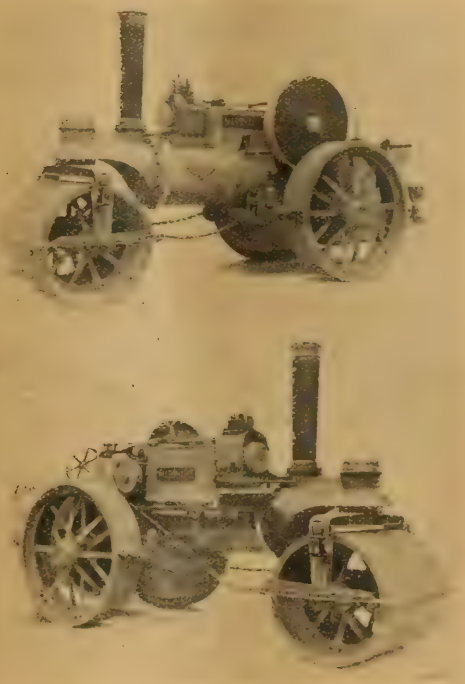
Workmen's Compensation.

In *Lay* v. *Teddington Urban District Council* (vol. xlix., p. 156) a scavenger employed by the council went (during working hours) to the lavatory of a public-house, and on returning to resume work fell and broke his thigh. It was held by the judge of the Kingston County Court that the accident was not an accident "arising out of and in the course of the employment," and judgment was given for the council.

"MARSHALL" ROAD ROLLERS.

A NEW TYPE OF ENGINE.

Our illustrations show an entirely remodelled and modern design of road roller recently placed on the market by Messrs. Marshall, Sons & Company, Limited, Britannia Ironworks, Gainsborough. It is made throughout from new patterns, in conformity with the best practice, and embodies patents and mechanical features exclusive to its manufacture. The object has been to produce an engine highly economical in fuel, in water consumption, of correctly distributed weight, and capable of thoroughly consolidating road surfaces on steep inclines and levels. The feature of convertibility from roller to traction engine, or *vice versâ*, has been scientifically achieved



VIEWS OF NEW TYPE OF "MARSHALL" ROAD ROLLER.

in the design, without impairing the characteristics of great constructional strength and durability. The accurate proportions of engine and boiler promote high mechanical efficiency, and ensure great tractive and driving power when the engine is employed for traction purposes, or for driving stationary machinery.

The cylinder base is planed and fixed on a pressed steel mounting with planed face, and the cylinder body, covers and steam chest are heavily lagged. The piston, adjustable crosshead, connecting rod and crankshaft follow closely on standard practice, but the crankshaft bearings are made of exceptional width, and are adjustable. They are also fitted with self-oilers of the latest "ring" pattern.

The boiler, which is of the usual locomotive-multitubular type, incorporates a "Marshall" patent cambered crown firebox, and is suitable for a continuous working pressure of 180 lb. per square inch. The boiler feed is maintained by a continuous action geared down feed-pump, and an automatic feed-water injector.

The power transmission is arranged on the four-shaft principle. The speeds obtainable are about 1½ and 3 miles per hour for road rolling, and 2 and 4 miles per hour when the engine is converted for traction work. The change speed gear wheels have machine-cut teeth. The first intermediate shaft is machined square between its bearings to carry the sliding portion of the two-speed gear. The bearings

are fabricated by continuous-action oiling rings, and all shafts are accurately machined and aligned.

The hind axle is made of a large diameter, and the keying for the winding drum centre and the bevel wheel of the four-pinion differential gear is arranged so that the axle can be easily withdrawn without removing the tender.

Several improvements combined in the fore-carriage ensure absolute freedom of movement for the front rollers, and allow them to accommodate themselves to uneven road in either forward or backward travel. By these means, and also the differential gear on the main axle, the roller is capable of being easily steered and manœuvred, and there is no tendency for the front rollers to "backlash." All the rollers have special cast-iron renewable rims, and the back rollers are fitted with patent spring scrapers. By the insertion of a pin the scrapers can be thrown out of action, so that frost spikes can be used if required. The track of the front rollers overlaps the tracks of the hind rollers by about 3 in. on either side. The front rollers are fitted with spring scrapers, front and back.

"Pickering" type governor, swivelling guide pulley for winding drum rope lead, and awning, are optional equipment, as are also a tubular feed water heater, barrel water tank, and fuel rack around tender top.

Several of these rollers have been put into commission in various parts of the country, and from the reports received from the users, there is evidence to show that the type is all that the makers claim it to be, and that it is a distinct improvement in this particular class of road engine.

SEWAGE AND SEWAGE DISPOSAL APPLIANCES.

MANUFACTURERS' REPORTS.

As a consequence of the continued restriction of municipal activities, there has been a further decline in the demand for sewage disposal and sanitary apparatus and ironwork for municipal works.

Several important contracts for sprinklers and sewage disposal appliances and sanitary ironwork have, however, been secured from municipalities. Some of these, by the Ames-Crosta Sanitary Engineering Company, Limited, 12 Victoria-street, Nottingham, are being carried out under difficulties, but many are in abeyance until the close of the war.

Good contracts have also been secured in the Dominions, among which may be mentioned a large contract for sanitary ironwork for Port Elizabeth; also one of the largest contracts for sewage distributors so far given out in the Dominions has been obtained from the City of Cape Town for the patent "Simplex" sewage distributors.

The efficiency of these distributors has been further demonstrated by their adoption and installation, together with other apparatus and ironwork, in military and internment camps, hospitals and convalescent homes, ammunition works, shell-filling factories, aerodromes, and other works carried out by the War Office, the Admiralty, the Office of Works, and other Government departments.

The carrying out of these contracts has to a large extent compensated for the temporary suspension of municipal work.

* * * *

During the past year Messrs. Tuke & Bell, Limited, the Carlton Engineering Works, High-road, Tottenham, N., have again been mainly occupied in the manufacture of filtering apparatus for the Government.

The firm have carried out a very considerable number of sewage purification schemes, but the bulk of these have been either for camps, munition works, or hospitals, including an installation for Lord Derby, the Secretary for War. They have supplied a considerable number of their "Ideal" revolving distributors in various sizes, of which a proportion have been for India, where this type of distributor is much appreciated. They have also supplied their water-softening plant and sewage ejectors, both for domestic purposes and in larger sizes, for various factories.

* * * *

During 1916 the Pulsometer Engineering Company, Limited, Nine Elms Ironworks, Reading, were particularly busy in steam-pumps (Hon. R. C. Parsons' patents) for pumping crude sewage.

These pumps have been in special demand for sewage works, military camps, national factories, &c., both in this country and abroad. The large number of orders received is an indication of the great need of a simple pump capable of elevating unscreened sewage, and of the success with which the Stereophagus pump has filled this want.

* * * *

The activities of Messrs. Jones & Attwood, Limited, Stourbridge, during the past twelve months embrace a large amount of work in sewage treatment and ejector plants for camps, munition factories, military hospitals, &c., and, when sanctioned by the Ministry of Munitions, for corporations also; also in the development of the activated sludge system of sewage treatment.

As regard the activated sludge process, five large plants have been installed and two others are in course of construction, while schemes for many parts of the world are designed and under consideration. Difficulties have been overcome, and the main features have been thoroughly proved and established.

The collaboration of Dr. Fowler's staff in the Frankland Laboratory of the Manchester University with the firm's engineering staff has enabled great progress to be made on thoroughly scientific lines. The problems already solved enable them definitely to announce that—(1) Aëration with the necessary circulation and mingling of the sewage and activated sludge is best secured by means of compressed air and diffusers; (2) very porous diffusers of great strength and uniform porosity can be supplied that will not choke with ordinary treatment; (3) by means of pulsating valves the volume of air required has been considerably reduced; (4) the sludge can be satisfactorily settled, returned to circulation, or withdrawn for treatment while the plant is in continuous operation without risk of septic action; (5) the sludge when treated is a valuable fertiliser, rich in nitrogen, and easily handled. This has been fully demonstrated by many experiments on agricultural and horticultural produce from delicate hot-house plants to root crops. Further particulars, illustrated by photographs, will be published in the near future.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

State Expenditure on Housing.—A Treasury return which has been issued, giving particulars of State expenditure under the Housing Act of 1914, shows that the amount expended by the Commissioners of Works on the Woolwich housing scheme up to March 31st last was £806,660. Under an agreement made with the Scottish National Housing Company, £20,700 was advanced for the erection of dwelling-houses for Admiralty employees at Rosyth. The total authorised issue from the Consolidated Fund under the Act is £2,000,000, and the balance remaining at the end of the last financial year was £1,154,716.

Refuse Destruction in 1916.—During the year 1916 it has been almost impossible to make any appreciable headway as regards municipal destructors, and beyond clearing up the following contracts and handing them over to the municipalities concerned, Messrs. Hughes & Stirling, 6 Stanley-street, Liverpool, makers of the "Sterling" refuse destructor, have not carried out any large municipal work. (1) The borough of Widnes—3-cell back-fed destructor, with tar-macadam plant, buildings, chimney, engine, dynamo, mortar mill, stone crusher, &c., complete; (2) the borough of Sutton Coldfield—3-cell back-fed destructor in connection with the borough electricity works; our contract included for the complete plant, boiler, buildings, chimney, piping, accessory machinery, &c.; (3) the borough of Luton—6-cell back-fed destructor in connection with the borough sewage pumping station; (4) the urban district council of Teddington—4-cell front-fed destructor in connection with the council's sewage pumping station. In addition to the above work, however, the firm have carried out a large contract for Turin, Italy. This plant consists of twenty-four cells, top fed, with full steam-raising plant, electric fans, pumps, &c., the whole for supplying steam at high pressure to a large industrial factory. The entire plant was completed in October, 1916, and has a capacity of at least 360 tons. With reference to Canada, the company's licensees, Messrs. the Griscom-Russell Company, of New York, have been engaged upon a 12-cell top-fed destructor for the city of Toronto, and have recently completed various other destructor plants, notably for the cities of Halifax, Pittsburg, Berkeley, Cal., and Columbus.

The Legislation of 1916 in Relation to Municipal Engineering.

By J. B. REIGNIER CONDER, a Solicitor of the Supreme Court.

The only Acts that need be noticed in detail are the Local Government (Emergency Provisions) Act and the Naval and Military War Pensions, &c. (Expenses) Act. The first of these (as will be seen) deals with a great variety of matters, and contains an important qualification of some of the provisions of the second, which might equally well (if not better) have been incorporated in the latter itself. There are obvious disadvantages in the "referential" method of legislation, and it might surely have been avoided in the case of two Acts of the same Session passed (as these were) within two months of each other.

Only brief reference will be necessary to the Consolidated Fund, Expiring Laws Continuance, and Public Works Loans Acts.

Local Government (Emergency Provisions).

The full title of the *Local Government (Emergency Provisions) Act* is "An Act to make provision with respect to officers and servants of local authorities serving in or with His Majesty's Forces, and to make various administrative provisions with a view to economy in money and labour in connection with the present war," and it is a veritable miscellany of legislation.

With exceptions, which we shall indicate, it is to have effect only during the continuance of the war, and afterwards for such period or periods (if any), not exceeding one year, as the Local Government Board may fix.

It is divided into three parts, each dealing with a variety of subjects, arranged somewhat promiscuously, some of which it will be sufficient merely to indicate, whilst others call for more detailed notice.

PART I.

(*a*) PAYMENTS TO OFFICERS AND SERVANTS OF LOCAL AUTHORITIES IN NAVAL OR MILITARY SERVICE.

Any local authority may grant leave of absence to any officer or servant for as long a period as may be necessary to enable him to serve in or with His Majesty's Forces for the purposes of the war; and may (*a*) while he is so serving pay to him, or to his wife, or other dependants nominated by him, a sum which shall not, without the sanction of the Local Government Board, exceed his civil remuneration after deducting therefrom the amount of his naval or military pay and allowances; and (*b*) in the event of his death, for a period not exceeding twenty-six weeks after the date on which he is notified to his widow or other dependants as dead or missing, pay to her, or them, sums calculated at the same rate as those previously paid to him, her, or them. In fixing the sum to be paid to the widow or other dependant, regard is to be had to any pension or other sum payable out of any charitable fund; and it is not to be incumbent on the local authority to reduce any payment made to an officer or servant on the ground that during his service with the Forces he has become or becomes entitled to increased naval or military pay in consequence of receiving a commission or promotion in rank. These provisions are to apply retrospectively to the case of any officer or servant who before the passing of the Act (May 17, 1916) took service in or with His Majesty's Forces with the sanction or permission of the local authority; and any resolution, promise, sanction, or permission passed or given by a local authority to any such officer or servant, with a view to his so serving, is to be binding, but only to the extent to which it could have been passed or given if the Act had been in force. Where, however, before the passing of the Act a local authority resolved, promised, sanctioned, or agreed to make payments in excess of the amounts authorised by the Act, any such excess payments, up to the date of the passing of the Act, or such later date as may be determined by the Local Government Board, are to be deemed to have been lawfully made, and that board are to sanction their continuance in any case where it appears to them that the man joined His Majesty's Forces in reliance on such resolution, promise, sanction, or agreement, and that the amount of the excess is not unreasonable. But where the scale of payments adopted by a local authority does not exceed the scale of payments for the time being laid down for officers and servants of His Majesty's Civil Service serving with His Majesty's Forces, the sanction of the board is not to be necessary; and any payments made in accordance with such scale are to be deemed to have been lawfully made.

(*b*) PAYMENTS UNDER SUPERANNUATION SCHEMES.

If an officer or servant of a local authority dies while serving in or with His Majesty's Forces, or in consequence of wounds or disease received or contracted during such service, which prevented him from returning to the service of the local authority, the latter are to have, and to be deemed to have always had, power to make to his widow and other dependants such payments as could have been made to them under any superannuation scheme (whether established by statute or otherwise) in force in the district, had he been actually serving the local authority at the time of his death. All service by an officer or servant of a local authority in or with His Majesty's Forces for the purposes of the war is, for the purpose of any enactment providing for the superannuation of such officers and servants applicable to his case, to be aggregated and reckoned with his service as an officer or servant of the local authority; and, unless an agreement to the contrary has been made before the passing of the Act, he is to contribute to the superannuation fund (if any) the same amounts (if any) as he would have contributed if he had continued in their actual service, and received the normal remuneration.

(*c*) For the purposes of calculating the amount of such contributions and superannuation allowances, the amount of the salary or wages and emoluments during the period of service in or with His Majesty's Forces is to be deemed the amount which the officer or servant would have received during that period had he remained in the actual service of the local authority. Nothing in the foregoing enactments is to affect the provisions of the Elementary Teachers (Superannuation) Acts, 1898 to 1912, or of the Elementary Teachers (War Service Superannuation) Act, 1914.

PART II.

(*a*) MISCELLANEOUS.

This part contains provisions with respect to allowances to persons appointed as temporary substitutes, the notification of diseases, and the use of institutions, buildings, or other premises belonging to local authorities for the accommodation of sick or wounded sailors or soldiers, or for other purposes in connection with the war, and the employment of servants of the local authority in or about any institution so used, or otherwise (with the consent of the local authority) in connection with the war; also with respect to the expenses of the Metropolitan Asylums Board, the calculation of sums repayable to guardians out of the Metropolitan Common Poor Fund, and the amounts payable or transferable by the London County Council on account of pauper lunatics.

(*b*) MEDICAL OFFICERS AND INSPECTORS OF NUISANCES.

If a temporary substitute is appointed with the sanction of the Local Government Board to replace any medical officer of health or inspector of nuisances who has been granted leave of absence in accordance with the provisions of the Act to serve in or with His Majesty's Forces, the county council are to be liable, under the Local Government Act, 1888, sec. 24, subsection 2 (*c*), to pay half the aggregate amount of the sum paid by the local authority to the medical officer or inspector so replaced, or his wife or other dependants under the present Act, and of the salary of the temporary substitute.

(*c*) LOCOMOTIVES ON HIGHWAYS.

Sec. 5 of the *Locomotives Act*, 1898, is to have effect as if for sub-section (1) thereof (which provides for the number of attendants for locomotives) were substituted sub-section (1) of sec. 25 of the Local Government (Scotland) Act, 1908. Sec. 6 of the Locomotives Act, 1865, and sec. 2 of the Locomotive Threshing Engines Act, 1894, are to have effect as if the proviso to each of those sections were omitted. Sec. 6 of the Act of 1865 permits the use of steam engines for

placed and within 25 yds. of a highway, with the proviso that a person must be stationed in the road to signal the driver to stop, when necessary, and to assist horses and carriages, and that the driver must stop at proper times. Sec. 2 of the Act of 1894 relieves traction engines and machinery used for threshing within 25 yds. of a highway from the obligation to be kept in a building or behind a fence, with a similar proviso.

(f) LOCAL GOVERNMENT BOARD ORDERS, ETC.

Statutory Orders, &c., of the Local Government Board, instead of being sealed, may be given, altered or revoked by letter or other writing, signed by a secretary or assistant secretary of the board; but this provision does not apply to Scotland or Ireland.

(g) RETURNS AND REPORTS.

It is to be sufficient to lay a summary of local taxation returns before Parliament, instead of the returns required by the *Local Taxation Returns Acts*, 1877 to 1882, the *Municipal Corporations Act*, 1882, and the *Local Government Act*, 1888; and local authorities are not to be required to report to the Local Government Board the proceedings of Assessment Committees or to make to that board any return of the superannuation allowances and gratuities paid under the Police Local Officers Superannuation Act, 1896. The statements required by the London (Equalisation of Rates) Act 1894 and 1 7 need not be made out. The annual report of Part II. of the Housing of the Working Classes Act, 1890, need not be presented to the Local Government Board as required by sec. 44 of that Act. The Board of Agriculture and Fisheries are relieved of certain obligations, including the obligation to require county, borough, district and parish councils to send reports of their proceedings under the Small Holdings and Allotments Act, 1908. Metropolitan borough councils need not make annual returns of their proceedings, or lists of their members, under the Metropolis Management Act, 1855.

(h) AUDIT OF ACCOUNTS.

The powers given to the Local Government Board by sec. 3 of the Local Government Act, 1894, to modify the enactments as to publication of notice of audit of accounts of district and parish councils are extended to all accounts of local authorities, subject to audit by a district auditor, and the board are to have power to prescribe the period for which the accounts of any such authority to which sec. 5 of the *District Auditors Act* 1879, applies, are to be made up and audited.

(i) CASUAL VACANCIES AND ELECTIONS.

There are provisions with respect to the filling of casual vacancies on councils, boards of guardians, commissioners, &c., and the *Elections and Registration Act*, 1915, is amended. These provisions are permanent.

(k) NAVAL AND MILITARY WAR PENSIONS.

The contributions made by local authorities towards the administrative expenses of local district committees under sec. 2 of the *Naval and Military War Pensions, &c., (Extension) Act* (referred to below) are to be subject to the sanction of the Local Government Board. This provision is permanent.

(l) SALE OF FURNITURE

Powers are given to sanitary authorities to make, either alone or in conjunction with other such authorities, arrangements for the storage of furniture and effects belonging to persons serving in or with His Majesty's Forces.

(m) OMNIBUS ROUTES.

Omnibuses are not to use any route which has not been lawfully used by omnibuses plying for hire within five miles prior to March 1 1916, except with the consent of the highway authority, or, if more than one, every highway authority liable for the repair of the highways along which the route runs. Such consent may be given upon such conditions as the highway authority may consider fit. If, on the application of the Local Government Board such consent is unreasonably withheld, or if such conditions are unreasonable, the new route is not to be used without the consent of that board. Any one who drives an omnibus in contravention of this section, or who causes or permits any omnibus to be driven along any route in contravention of this section is to be liable to a fine not exceeding £5, or to a further penalty not exceeding £1 for each day on which such contravention is continued after the service of notice thereof by the council of the borough or district. There is however a proviso that the foregoing provisions are not to apply where a route is altered by reason of the temporary diversion of traffic on account of the breaking up of a road, or in pursuance of the directions of any police authority, or other directions lawfully given; nor to any omnibus in any case where the Admiralty, Army Council, or Minister of Munitions are of opinion that an omnibus service is necessary for, and is to be used by, munition workers or other persons engaged on Government war service. It is also provided that the section is not to be deemed to detract from any existing powers of highway authorities in regard to omnibuses. "Omnibus" includes every omnibus, char-à-banc, wagonette, brake, stage-coach, or other carriage plying for hire or used to carry passengers at separate fares.

PART III.

(a) INTERPRETATION, ETC.

"Local authority" means any person, or body of persons, who receive or expend the proceeds of any local rate, and any other public body which the Local Government Board may determine to be a local authority; but overseers of the poor are not to be included except by direction of that board. And where any such authority is a police authority, it is not, as such, to be deemed, for the purposes of Part I., to be a local authority. Except where the context otherwise requires, "allowances" means the separation allowances made to the wives and families and dependants of sailors and soldiers, and includes family allowances for soldiers living at their own houses in the United Kingdom. "Civil remuneration" includes the salary or wages and other emoluments which the officer or servant would have been receiving if he had remained in the actual service of the local authority.

There are also provisions for bringing teachers, officers and servants in elementary non-provided schools, and in institutions aided by the local education authority within the Act. For the purposes of the Act, or such of them as may be specified by the Local Government Board, service in connection with naval or military operations which the board consider may properly be treated in the same manner as actual naval or military service is to be deemed to be service with His Majesty's Forces.

(b) SCOTLAND AND IRELAND.

Provision is made for the application of the Act to Scotland and Ireland, with suitable modifications, including an amendment (which is permanent) of the Poor Law Relief (Ireland) Act, 1914.

Naval and Military War Pensions.

The *Naval and Military War Pensions (Extension) Act* provides that £1,000,000 shall be charged on and issued out of the Consolidated Fund in the year ending March 31, 1916, towards meeting the expenses of the Statutory Committee constituted under the Naval and Military Pensions, &c., Act, 1915 (referred to as "the principal Act"). The council of any county, borough, or urban district for whose area a local committee has been established under the principal Act may make such payments as they think fit towards the administrative expenses of any such local committee, and of any district committee appointed under that Act in their area. Power is also given to the council of any borough (including Metropolitan boroughs and the City of London), or urban or rural district which is, in pursuance of any scheme made under sec. 2 of the principal Act, a separate district, or is wholly or partly included in a separate district, for which a committee is appointed, to make such payments as they think fit towards the administrative expenses of the district committee. (As already stated, however, the Local Government (Emergency Provisions) Act provides that such contributions are to be subject to the approval of the Local Government Board.) Payments may be made out of any fund or rate out of which the expenses of the council are payable, and may be made subject to any conditions as to the application of such payments which the council think fit to impose. The Act is to be construed as one with the principal Act.

Consolidated Fund.

There are four Acts authorising the issue of money out of the *Consolidated Fund*. The aggregate amount authorised for the service of the year ending March 31, 1916, is £420,178,000, and the aggregate amount for the service of the year ending March 31, 1917, is £1,106,858,480.

Expiring Laws Continuance.

The *Expiring Laws Continuance Act* provides for the continuance until December 31, 1917, of (among other Acts) the Locomotives Act, 1865, the Motor Car Act, 1903, and the Local Government Elections Act, 1906. Any unrepealed enactments amending or affecting the

continued Acts are, in so far as they are temporary, continued to the same date.

Public Works Loans.

The *Public Works Loans Act* provides for the issue by the National Debt Commissioners of £1,500,000 for the purpose of loans by the Public Works Loan Commissioners, and £200,000 for the purpose of loans by the Commissioners of Public Works in Ireland; £200 of the loan of £10,000 to the Eyemouth Harbour Trustees, and portions of certain loans by the Commissioners of Public Works in Ireland to various borrowers are written off.

A MOTORISTS' MAP HOLDER.

Mr. C. H. Cooper, M.INST.C.E., the borough engineer of Wimbledon, has invented a weather-tight map case, for which he has taken out full patents. The maps are in strips on rollers, as shown in the illustration. Each strip contains a transparent portion through which the map strips beneath can be read. To obviate the blurring effect due to several transparencies being interposed between the map strip to be read and the observer's eye, the transparent material is as far as possible [illegible] [illegible]

Householders and Snow Removal.—[illegible]

Horsman Specialities.—[illegible]

SOME RECENT PUBLICATIONS.*

SOME MODERN METHODS OF VENTILATION, with special reference to Public Buildings. By R. Grierson, A.M.I.M.E., [illegible] Price [illegible] London: Constable & Co.

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WATERWORKS PLANT.

MAKERS' ACTIVITIES IN 1916.

The manufacture of special water purification plant for Government purposes has occupied much of the attention of Messrs. Bell Bros., Calder Iron Works, Ravensthorpe, Yorks., and this has of necessity greatly curtailed possibilities for work in any other direction. In spite of such drawbacks the firm have, however, constructed the large plant for the Nottingham Corporation, which is just about to undergo erection. Further plants have been supplied to the Holyhead Water Company, to the Aberavon Corporation, and a few smaller places. A special point that will interest our readers is the fact that the Leicester Corporation have placed an order with the company for plant to treat 6,100,000 gallons per twenty-four hours of the Derwent water supply, thus falling into line with the decision arrived at by the Nottingham Corporation. A considerable number of municipal orders which have been placed with the firm will not be executed for an indefinite period. In these times manufacturers' requirements are greatly increased, owing to the need of river and other water supplies being purified in great quantities in connection with special Government work, and they have been receiving special attention. The largest manufacturer's order going through has a capacity of 8,000,000 gallons per twenty-four hours.

* * * *

United Water Softeners, Limited, of Imperial House, Kingsway, the well-known makers of water purification and softening plant, have, during the past year, been almost exclusively occupied in the supply of these plants for Government purposes and use in munition factories. A large number of their plants are in use on the various Fronts, and their specialities have been prominently to the fore in the equipment of the large national factories erected in this and allied countries.

The firm have considerably developed their business in water filters, and are now supplying a very compact and powerful type of improved filter suitable for use in the purification of public and private water supplies, works' effluents, &c.

The war has brought the question of water sterilisation into the forefront of water purification problems, and United Water Softeners, Limited, have developed several important processes for the rapid and effectual sterilisation of contaminated or suspected water supplies.

We referred in a recent issue to the increasing attention now being paid to the use of chlorine gas in water sterilisation in the United States, and the success which has attended its use in many large installations, notably those of New York City, Newhaven, Conn., New Brunswick, and New Brighton. The prohibitive price of hypochlorite has given an immense impetus to the adoption of direct chlorination, and many hundreds of such plants are now at work in the States. Messrs. United Water Softeners have secured the sole British rights in a unique chlorine control apparatus, at last, it is claimed, solving the problem which has hitherto barred the way to the universal adoption of direct chlorine treatment in preference to indirect methods—viz., the difficulty of controlling the dose. The new apparatus is exceedingly simple and compact, and the working costs are stated to be below [illegible] hypochlorite method.

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The filter plant which the "Turn-over" Filter Company, 39 Chichester-street, Belfast, installed towards the latter end of 1914 for the Morley Corporation Waterworks has now been at work about sixteen months, and the period of guarantee expired last October. The engineer appointed to make the bacteriological and chemical examination on the water stated that "all the conditions of the contract were completely fulfilled," and in other respects the working of the filters has given complete satisfaction.

As regards the firm's special plant for filtration of water in swimming baths, only one installation was completed last year, as in this line expenditure has, of course, completely stopped. This was an installation for the new baths built by the Motherwell Corporation. For a district in which there are a very large number of munition workers, and the attendance at the baths has been very large. During the opening weeks the attendance amounted to approximately 5,000 bathers per week and for several months to an average of 3,000 per week. In spite of this large attendance, the water has been kept in satisfactory condition, and the last report received stated that it was perfect in every way. On the strength of such reports as these, the system should be popular when the war is over.

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The Ransome-verMehr Machinery Company, Ltd., Brunswick House, Westminster, have been exceedingly busy during the past twelve months on the manufacture of their Ransome drifting-sand filters for the British War Office, these filters being destined for purifying water for the troops of the Expeditionary Forces. They have also supplied these filters to the French and Rumanian Governments.

In addition, it may be mentioned that the first units of the large purification plant that the firm are installing for the city of Toronto (60,000,000 gallons of water per day) have been successfully operating for the past three months. Further, they have in hand an order for filters for the Brazilian Government for treating 4,500,000 gallons of water per day.

* * * *

The Pulsometer Engineering Company, Limited, of London and Reading, have not carried out any large contracts for a waterworks plant during the past twelve months, but they have supplied several of their turbine pumps as auxiliaries to the main waterworks plant for the purpose of supplying an additional quantity of water to places where military camps have been built, or where the demand has increased owing to increase in population due to the erection of munition factories.

For obvious reasons it is not advisable to mention the localities where these pumps have been fixed. The pumps have all been of the company's standard make, direct-coupled to electric motors or high-speed petrol engines. When the pumps have been put down for the purpose of supplying camps they have generally been arranged to deliver into a new main, but in villages and small towns, where the demand has increased owing to increase in population, the extra quantity has been obtained by fitting turbine pumps to act as boosters—that is, to increase the pressure in the existing mains so as to enable a greater quantity of water to be forced through the mains into the particular district.

This is a very useful application of the turbine pump, as it can be placed in small houses or underground chambers, so that the cost of the installation is very small, and as the Pulsometer Company's turbine pumps are very efficient, the running costs are comparatively light. These pumps require very little attention, as they will run for weeks without any lubrication, and as the maximum pressure can never be exceeded there is no risk of causing an excessive pressure on the mains.

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The water purification department of Messrs. Mather & Platt, Limited, London and Manchester, has during the past year been busily employed in the construction of mechanical filters for H.M. factories and other war purposes, some of which have been exceptionally large contracts. The restrictions imposed by the Government on all classes of engineering manufactures, and also the curtailment of loans by the Local Government Board, have naturally had a large influence in causing a dearth in public water supply installations at home. Nevertheless, Messrs. Mather & Platt have been able to execute another order for the Sheffield Corporation, which completes the Rivelin installation of twenty-four filters, dealing with a total of 4,500,000 gallons per day. They have also several other contracts in hand for public water supplies abroad, including Japan, India, Malay States and Egypt.

* * * *

The Candy Filter Company, Limited, 5 Westminster Palace Gardens, S.W., have been engaged during the past year supplying their well-known mechanical filter plants to various municipalities, as well as Government establishments, camps, munitions and explosive factories, &c. A large installation recently completed comprises chemical plant and mechanical filters for dealing with the whole of the water supply of Falmouth, and a further repeat order has just been placed with the company for an extension of the plant to meet the increasing demand for filtered water at this favourite Cornish Riviera health resort, which, in adopting Candy filters, has followed the example of such well-known watering-places as St. Leonards-on-Sea; Hythe, Kent; Hastings, Paignton, Harrogate; Cowes, Isle of Wight, and Torquay.

The Candy "Deolor" filter system continues to be extensively adopted by authorities who have to deal with bacteriologically suspicious water supplies, in-

stallations having been laid down at some of the most important military stations in the country. The "Declor" system, it is claimed, ensures, by the use of chlorine, the absolute destruction of the B. coli, cholera vibrio, and typhoid bacillus, and also afterwards removes from the water any excess of free chlorine, so that the purified water is not only absolutely safe and pure, but also palatable and quite free from the unpleasant odour and taste often found in waters that have been treated with chlorine without the "Declor" system.

A large municipality in South Africa, which has used Candy Filters for the past six years, has just sent a repeat order for more filters.

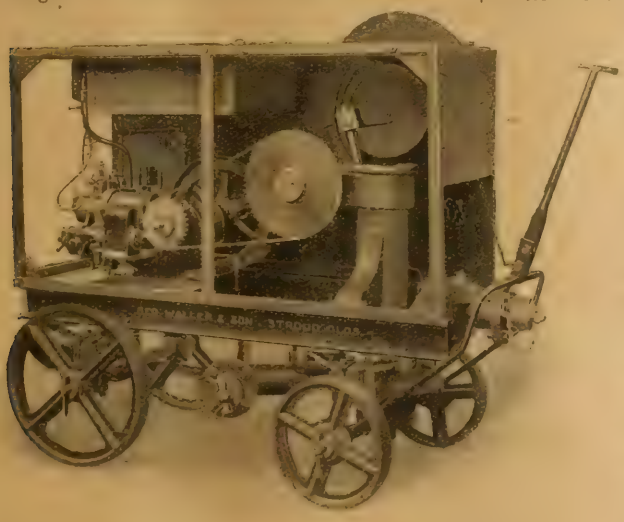
Several installations of Candy iron removing filters have been laid down, and although many filtration plants for municipalities are being held over until the end of the war, the large number of Candy filter plants required for Government use and for abroad have kept the company very busy during the past twelve months.

CESSPOOL EMPTYING.

POWER-DRIVEN PORTABLE PUMPS.

In addition to the emptying of cesspools, the apparatus illustrated herewith will be found useful for council purposes in a variety of ways, for they will pump water, empty sludge tanks, or trenches, and a pulley can be fitted to the engine, and arrangements made for easily disconnecting the pump, so that the set can be taken to different depots. It is always ready for any sort of work, and is a real labour saver.

The pump is of special design for dealing with thick sludge, having large area valves of the hinged flap type with rubber faces, and a detachable cover is provided over each valve, so that these are easily accessible. The plunger is 5-in. diameter, 8-in. stroke, leather packed, with forged steel rod, and crankshaft, with substantial gun-metal bearings.



WALLER'S POWER-DRIVEN PORTABLE SLUDGE PUMP.

The engine is of a high-class expert design, having electric magneto ignition for running on petrol, and will develop full load at the moderate speed of 400 revolutions per minute. The cooling water flows to the cylinder jacket by gravity, thus avoiding the circulating pump, which is a feature of some other types of portable engines. High-class anti-friction metal bearings are fitted, and with proper adjustment of lubrication these engines will run continuously over very long periods without attention.

The power from the engine is transmitted through Renolds' chain and machine-cut gears, forming a reliable drive.

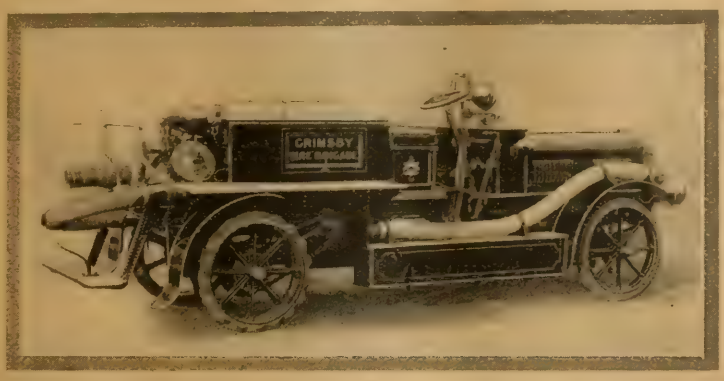
The set is mounted upon a steel under-frame, having four wheels with steel axles, springs swivelling fore carriage, and forged draw handle. The machinery is totally enclosed in a neat steel-plate cover, built upon an angle iron frame with large detachable doors, so that easy access is given for cleaning down, oiling, &c. The petrol reservoir and circulating water tank are carried over the engine inside the casing with screwed plugs, for filling from outside, so that this can be done while engine is working, if necessary.

The engine can be readily started, and the set could be run by a youth.

The whole is made by Messrs. George Waller & Son, at the Phœnix Ironworks, Stroud, Gloucestershire, and prospective clients are invited to inspect these sets in course of manufacture and under test.

MOTOR FIRE ENGINES.

During the year 1916 Messrs. Merryweather & Sons, the well-known fire engineers, of Greenwich-road, London, S.E., supplied a number of their "Hatfield" motor fire engines to various Government Departments, including the Admiralty, War Office, Ministry of Munitions, India Office, and Crown Agents for the Colonies. Being extremely busy on war work of an urgent character, their output of vehicles for municipal requirements did not reach anything like its normal level, but "Hatfield" engines were supplied to Edinburgh, Rochester and Grimsby, these orders going through under a priority certificate. The well-known firm of Messrs. Brunner, Mond & Co., Northwich, also received delivery of a second engine of this design, and orders were received from Leeds, Margate, Hoylake and West Kirby, Ripon, Selby, &c.



"HATFIELD" MOTOR FIRE ENGINE SUPPLIED TO GRIMSBY.

The accompanying illustration shows the "Hatfield" motor fire engine supplied to Grimsby, this being the second of its type for the well-known East Coast port, and the fourth Merryweather motor machine to be placed in commission there. It has a pumping capacity of 400 gallons per minute, and is mounted on steel wheels, the rear wheels being fitted with cross-ribbed pattern solid rubber tyres.

Water Purification and Softening.—At a meeting of the Institution of Civil Engineers of Ireland to be held in Dublin on February 5th, a paper entitled "Recent Practice in the Purification and Softening of Public Water Supplies" will be read by Mr. Fred. C. Uren, M.INST.C.E.I., engineer and surveyor to the Aldershot Urban District Council. The chair will be taken at 8 p.m.

Literature of Municipal Engineering in 1916.

[Any book included in this summary will be forwarded, post free, on application to the St. Bride's Press, Limited, 24 Bride Lane, Fleet Street, London, E.C. The published price must be enclosed.]

In accordance with our usual custom, we publish below a summary of the books dealing with subjects of interest to municipal engineers which have been issued during the past year. In doing so we may, perhaps, direct the attention of our readers to THE SURVEYOR Book Department, through which technical books, issued by various publishers, may be obtained from a single source with the minimum amount of trouble. Orders by post receive careful and prompt attention, and particulars and lists of books on any desired subject may be obtained on application. The references in parentheses are to the volume and page of THE SURVEYOR in which a review has appeared.

Annuals and Year-books.

"Gas Works Directory and Statistics, 1915-16." Price 10s. 6d. nett. London: Hazell, Watson & Viney, Limited. (Vol. 49, p. 264.)

"Hazell's Annual, 1916." Price 3s. 6d. nett. London: Hazell, Watson & Viney. (Vol. 49, p. 234.)

"The Empire Directory of Municipal Authorities and Officials and Year-book." Price 5s. nett. London: The Sanitary Publishing Company, Limited. (Vol. 49, p. 302.)

"Willing's Press Guide, 1916." Price 1s. London: James Willing, Limited. (Vol. 49, p. 334.)

Architecture and Building.

"Architectural Building Construction." Vol. I. By W. R. Jaggard, F.R.I.B.A., and F. E. Drury. Price 6s. nett. Cambridge: The University Press. (Vol. 50, p. 509.)

"Laxton's Builders' Price-book for 1916." Price 4s. London: Kelly's Directories, Limited. (Vol. 49, p. 280.)

"Lockwood's Builders' and Contractors' Price-book." Price 4s. London: Crosby Lockwood & Son. Vol. 49, p. 234.)

"Spon's Architects' and Builders' Pocket Price-book." Price 2s. 6d. nett. London: E. & F. N. Spon, Limited. (Vol. 49, p. 179.)

"The Orders of Architecture." By A. B. Greenberg. Price 2s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 50, p. 561.)

Applied Mathematics.

"Applied Mechanics for Engineers." By C. B. Clapham, B.SC.ENG. Price 5s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 50, p. 509.)

"Graphics and Structural Design." By H. D. Hess, M.E. Second edition. Price 12s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 49, p. 615.)

"Mathematics for Machinists." By R. W. Burnham, M.A. Price 5s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 49, p. 264.)

Electricity.

"Large Electric Power Stations: Their Design and Construction." By Dr. G. Klingenberg. Price 25s. nett. London: Crosby Lockwood & Son. (Vol. 50, p. 204.)

Highways.

"Elements of Highway Engineering." By Arthur H. Blanchard. Price 12s. 6d. nett. New York: John Wiley & Sons. London: Chapman & Hall, Limited. (Vol. 49, p. 364.)

"Practical Roadwork." By H. T. Wakeham, M.INST.C.E. Price 1s. 6d. nett. London: Wyman & Sons, Limited. (Vol. 49, p. 472.)

"The Construction of Roads and Pavements." By T. E. Ingle, Professor of Highway Engineering, Leeds School of Engineering. Price 12s. 6d. nett. London: Hill Publishing Company, Limited. (Vol. 50, p. 481.)

"The Testing of Lime and Plaster for Ready Use: A Practical Guide for Engineers and Surveyors." Price 1s. nett. Ewing Hamilton & Co., 11 Todd Street, Westminster. (Vol. 49, p. 627.)

Hygiene, Public Health and Sanitation.

"Elementary Sanitary Engineering." By G. Bransby Williams, M.INST.C.E. Price Rs.5. Calcutta: Thacker, Spink & Co. (Vol. 50, p. 509.)

Sewerage and Sewage Disposal.

"Sewerage. The Designing, Construction and Maintenance of Sewerage Systems." By Prof. A. P. Folwell. (Seventh Edition.) Price 12s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 49, p. 560.)

"The Operation of Sewage Disposal Plants." A manual for the practical management of sewage disposal works, with suggestions as to improvements in design and construction. By Francis E. Daniels, director of water and sewerage inspection, Board of Health of the State of New Jersey. Price $·50. Published by *Municipal Journal*, New York, U.S.A. (Vol. 50, p. 169.)

Structural Engineering.

"Bridge Foundations." By W. Burnside, ASSOC.M. INST.C.E. Price 4s. nett. London: Scott, Greenwood & Son. (Vol. 49, p. 264.)

"Elements of Railroad Track and Construction." 2nd Edition. By W. L. Wilson. Price 10s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 49, p. 390.)

"Field Engineering" (17th Edition). By W. H. Seales, C.E. Price 12s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 49, p. 334.)

"The Stability of Arches." By Ernest H. Sprague, ASSOC.M.INST.C.E. Price 4s. nett. London: Scott, Greenwood & Son. (Vol. 50, p. 561.)

Steam and Mechanical Engineering.

"Elements of Heat-power Engineering." By C. F. Hirshfield, M.M.E., and W. N. Barnard, M.E. Price 21s. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 49, p. 302.)

"Machine Design." By A. W. Smith and G. H. Marx. 4th Edition. Price 12s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 50, p. 169.)

"Properties of Steam and Ammonia." By G. A. Goodenough, M.E. Price 5s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 49, p. 20.)

"Steam Boiler Economy." By W. Kent, M.E. 2nd Edition. Price 19s. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 49, p. 615.)

"The Mechanical Handling and Storing of Material." By G. F. Limmer, ASSOC.M.INST.C.E. Price 42s. nett. London: Crosby Lockwood & Son. (Vol. 50, p. 169.)

"Valves and Valve Gears: Vol. II., Gasolene, Gas and Oil Engines." By F. D. Furman, M.E. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 49, p. 390.)

Surveying.

"Geodetic Surveying." By E. R. Cary. Price 10s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 50, p. 481.)

"Tacheometer Surveying." By M. E. Yorke Eliot, ASSOC.M.INST.C.E. Price 5s. nett. London: E. & F. N. Spon. (Vol. 49, p. 121.)

Town Planning and Housing.

"The Housing of the Working Classes Acts, 1890-1909, and the Housing Acts, 1914, Annotated and Explained." 4th Edition. By C. E. Allan, M.A., LL.B., barrister-at-law, assisted as to the practice by F. J. Allan, M.D., D.P.H., medical officer of health to the City of Westminster. Price 12s. 6d. nett. London: Butterworth & Co., and Shaw & Sons. (Vol. 49, p. 434.)

"The Planning of the Modern City." By Nelson P

Lewis. Price $3.50 nett. New York: John Wiley & Sons. (Vol. 50, p. 111.)

"The Welsh Housing Year-book." Edited by Edgar L. Chappell. Price 1s. nett. Cardiff: The South Wales Garden Cities and Town Planning Association. (Vol. 49, p. 49.)

Valuation.

"Value for Rate-making." By H. Floy. Price 17s. nett. New York and London: The M'Graw-Hill Book Company, Inc. (Vol. 50, p. 481.)

Water Supply and Hydraulics.

"Hydraulic Flow Reviewed." By Alfred A. Barnes, A.C.G.I., ASSOC.M.INST.C.E. London: E. & F. N. Spon, Limited. (Vol. 49, p. 319.)

"Transactions of the Institution of Water Engineers, 1915" (Vol. xx.). London: The St. Bride's Press, Limited. (Vol. 50, p. 509.)

"Waterworks Handbook." By Alfred Douglas Flinn, Robert Spurr Weston, and Clinton Lathrop Bogert. 1st Edition. Three hundred and eleven tables and 411 illustrations. Price $6. New York: M'Graw-Hill Book Company. (Vol. 50, p. 269.)

Pocket-books.

"The American Civil Engineers' Pocket-book." Edited by Mansfield Merriman and others. Price 21s. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 50, p. 561.)

"The Architects' and Builders' Pocket-book." By the late Frank E. Kidder, T. Nolan, editor-in-chief. 16th Edition. Price 21s. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 50, p. 394.)

"The *Mechanical World* Electrical Pocket-book for 1916." Price 6d. nett. Manchester: Emmott & Co., Limited. (Vol. 49, p. 214.)

"The *Mechanical World* Pocket-diary and Year-book for 1916." Price 6d. nett. Manchester: Emmott & Co., Limited. (Vol. 49, p. 214.)

Miscellaneous.

"A Student's Book on Soils and Manures." By E. J. Russell, D.SC. Price 3s. 6d. nett. Cambridge University Press. (Vol. 49, p. 264.)

"Construction, Equipment and Management of a General Hospital." By D. J. Macintosh, M.V.O., M.B., LL.D., F.R.S.E. Price 15s. nett. Edinburgh and London: W. Hodge & Co. (Vol. 50, p. 561.)

"Determinative Mineralogy." By J. V. Lewis. Price 6s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. (Vol. 49, p. 234.)

"Directory of British Manufacturers for Russian Trade." Edited by R. A. Lenski. (Vol. 49, p. 214.)

"Clays and Clay Products." By A. B. Searle. Price 1s. 6d. nett. London: Sir Isaac Pitman & Sons. Limited. (Vol. 49, p. 264.)

"Manuring for Higher Crop Production." By E. J. Russell, D.SC. Price 3s. nett. Cambridge University Press. (Vol. 50, p. 561.)

"The Civil Engineer's Cost-book." By Lieut.-Colonel T. E. Coleman, R.E. Staff. Price 6s. nett. London: E. & F. N. Spon. (Vol. 49, p. 121.)

"The Railway Swindle." By Henry Murray. Price 2s. 6d. nett. London: Grant Richards, Limited. (Vol. 50, p. 509.)

"The Tithe Rentcharge Table for 1916." By P. W. Millard, LL.B. Price 1s. London: Shaw & Sons. (Vol. 49, p. 264.)

House Refuse Removal at Newcastle-on-Tyne.—In view of the shortage of labour, and with a view to securing the consumption in dwelling-houses of materials deposited in dustbins having a value for fuel, the Newcastle-on-Tyne Improvement and Streets Committee have given notice that, as from February 1st next, corporation employees engaged in removal of house refuse will have instructions to remove from dustbins and ashpits, and to leave on the premises of householders for consumption as fuel cinders, small coal, and other combustible material which ought to be burned. All householders are earnestly enjoined in the interests of public health to burn all vegetable and animal refuse, and not to deposit it in dustbins and ashpits, and further to refrain from depositing therein any wet refuse calculated to set up fermentation.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it a fact that both the Manchester and the Salford Corporations have declined to employ women sweepers for street work, notwithstanding that an important deputation of ratepayers desired them to do so? What is the reason for this refusal? Is it because these corporations are under the impression that their streets are models of cleanness, or that they have sufficient male labour for the purpose?

* * * *

Is it not satisfactory to hear that the town council of Aberdeen have at last decided as to the source of their proposed new water supply, and that, thanks to the researches of Dr. Houston, they will be able to make use of the waters of the river Dee for this purpose? Is it not rather remarkable that the recent introduction of "chemicals" for the sterilisation of water has so wonderfully revolutionised water purification, whereas for sewage purification chemical treatment, for this purpose, has practically been abandoned?

* * * *

Shall we obtain our future supplies of nitrogen from sewage, as suggested by Dr. S. Rideal, or from the atmosphere, as promised by an American engineer, whose name has not yet been divulged? Are we not more likely to be influenced by Dr. Rideal in his suggestion than by this engineer, whose pronouncements savour of "wonder-mongering"?

* * * *

Why does the Canadian town planning engineer appear to shirk curved streets and roads in his designs? Is it because the streets of nearly all American and Canadian towns are laid out in monotonous straight lines, crossing each other at right angles? Is it because of a supposed difficulty in constructing the sewers, or is it because of the real difficulty in measuring and laying out the building plots?

* * * *

What is going to be done about the serious earth slides which are constantly taking place on the Panama Canal? If, as is stated, the engineers have tried, without avail, colossal schemes of drainage, asphalting the surface of thousands of acres of land to prevent infiltration of rain, the erection of huge retaining walls, and other works to prevent these slides, what is left for them to do except to dredge and dredge, and dredge, at an exceedingly heavy annual cost?

* * * *

Is it a fact that the transport of some of our munitions and heavy ordnance is being seriously hampered by the rickety condition of many of the bridges over our derelict canals? Does it not seem a grievous absurdity that, owing to legal quibbles as to what body is responsible for their repair, the transport of military and civil goods should be thus hampered? Who will deliver us from this mighty burden of legal entanglements with which we are surrounded?

* * * *

Will it not be a long time before the Englishman gives up his cherished open fireplace and cheerful coal fire, and substitute the tame, unattractive, gas fire? Does not the grate and fireplace, with its chimney-piece, give also the designing architect a chance to improve the appearance of a room, and is it possible to do this when a gas fire is substituted? Has anybody yet clearly demonstrated what is the real monetary saving effected by substituting gas fires for coal fires, except for cooking purposes?

* * * *

Are elaborate experiments on earth pressures of much practical value? Is it not more important to be able to ascertain quite correctly what is exactly the nature of the soil, or formation, on which the foundations of a heavy structure will rest? Have there not been a large number of cases in the courts arising out of the difficulties of correctly ascertaining this, and if some more reliable and economical method than that of boring, or shaft sinking, could be introduced, would it not be of more value than mere academic experiments on earth pressures?

Law Notes.

EDITED BY J. B. REIGNIER CONDER, Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, on one side only, should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary copies of local Acts or documents referred to should be enclosed. **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

EXTRAORDINARY TRAFFIC.—"P. D. North" writes: Extraordinary traffic is being carried out in various parts of the district, and additional expenses are being incurred thereby. The traffic consists of the removal of timber by means of steam traction. Will you kindly furnish in your valuable paper a [illegible] form of Certificate of Surveyor with respect to such expenses, also general particulars as to how the accounts should be kept by local authorities?

Two forms of certificate are given in the Appendix to "The Law of Extraordinary Traffic on Highways," by Rayward Lalley, published by Sweet & Maxwell, Limited, 3 Chancery-lane. They are too lengthy to be set out here, but the following is an outline form suggested by a comparison of the two:

In the matter of the Highways and Locomotives Amendment Act, 1878, and the Locomotives Act, 1898.

To the [ ] District Council, being the highway authority which is liable to repair the highway leading from [ ] to [ ].

I, the undersigned, surveyor of the above-named highway authority, hereby report and certify that, having regard to the average expense of repairing highways in the neighbourhood, extraordinary expenses have been incurred by the said authority during the year ending ———, 19——, in repairing the said highway (which is about [ ] in length) by reason of the damage caused by excessive weights passing along the same, and extraordinary traffic thereon, namely:—

[Here set out the nature of the traffic in detail.]

The cost per mile of repairing the said highway during the said year was £[ ]. The cost of repairing all other highways of the like class, repairable by the said highway authority during the same period, was £[ ] per mile, and the average cost of repairing those highways and the highway in question during the preceding [ ] years was £[ ] per mile. In my judgment there was nothing but the damage caused by the said weight and traffic by which the increase above referred to in the cost of repairing the said highway can be reasonably accounted for.

Dated this ——— day of ———, 19——.

(Signed) ———,

Surveyor of the above-named [ ] Council.

In the above work (p. 69) it is suggested that a separate account should be kept of each road, breaking up long roads into two or more sections, and that the account books should enable the cost, during each year, of materials, cartage, labour, steam rolling, &c., on any given length of road, to be readily arrived at.

THE ADOPTION OF PRIVATE STREETS.—"A. P. S." writes: About ten years ago an estate owner laid out and formed a road on his estate. Buildings were erected on both sides of the road, and about six years ago an arrangement was come to between the estate owner and the urban district council that the road should be made up by the frontagers and kept in repair by them for six months, at the end of which period it was to be taken over by the council as a highway repairable by the inhabitants at large. The road was accordingly made up and kept in repair for six months by the frontagers. It has never been formally taken over by the council, however, and has now become greatly out of repair. The Private Street Works Act, 1892, has been adopted in the district. I should be greatly obliged if you would inform me, through the medium of THE SURVEYOR, whether the road has become a "highway repairable by the inhabitants at large," or whether it is now open to the council to make it up at the expense of the frontagers under the Act?

This depends upon whether the arrangement with the estate owner was [illegible] in effect, to a binding agreement by the council to take over the road, under sec. 146 of the Public Health Act, 1875. I think it is highly probable that the Court would hold that the frontagers having carried out their part of the arrangement, it was and is, binding on the council that the road is a highway repairable by the inhabitants at large. See *Bromley Local Board v. Tomlin*, 71 J.P., 1; December 5, 1891. *Folkestone Corporation v. Martin*, 76 J.P., 153.

HIGHWAY PUBLIC FOOTPATH SUBSIDENCE REPAIR.—"Perplexities" writes: There is a public footpath in this parish, which forms a short cut between two roads. The path skirts a hedge dividing two fields forming part of a large farm, and there is a natural stream or watercourse running alongside it. Owing, as is supposed, to the undermining action of this stream, aggravated by heavy floods, a large portion of the path has subsided to a considerable depth, and is practically impassable. The cost of reinstating the path at its original level would be very heavy. I shall be very grateful if you will let me have your opinion on the following points: (1) Is the rural district council, as highway authority, bound to raise the footpath to its original level, or what is the extent of their liability? (2) Is the owner of the land under any, and (if any) what liability? (3) Have the public a right to deviate along the other side of the hedge while the path is impassable?

(1) Unless the path has been completely destroyed the council are bound, in my opinion, to do what is necessary to render it as commodious to the public as it was before the subsidence took place, if repairs are reasonably practical. But they are not necessarily bound to restore it to its original level if it can be made equally commodious without doing so. If, however, it has been completely destroyed, and having regard to its position, and the propinquity of the stream, repairs must, in the nature of things, always be ineffectual, the liability to repair it would, in my opinion, be extinguished. See *Rex v. Landulph* (1 Moo. and R., 366). (2) No, I think not. (3) No, unless there is also a public right of way along that side.

PRIVATE STREET WORKS: APPORTIONMENT.—"Access" writes: In this (urban) district the council have decided to make up a certain private street under the Private Street Works Act, 1892 (which has been adopted). About mid-way between the two ends of the street there is a private road joining it at right angles, which is in process of formation. There are a few houses abutting on this road, at the end next the street to be made up, and which houses will undoubtedly be benefited by the proposed works. I shall be obliged if you will inform me, through the columns of your valuable paper, whether, in your opinion, these houses can legally be included in the apportionment.

Under sec. 10 of this Act the council may, if they think just, include in the apportionment any premises access to which is obtained from the street "through a court, passage, or otherwise," and which, in their opinion, will be benefited by the works. In my opinion, if the private road is being formed solely for the purpose of giving access to the houses abutting on it from the street which is to be made up, the houses can be included in the apportionment. But if, on the other hand, the road is in process of development as a public street, the section would not apply, and the houses could not be included. See *Newquay Urban District Council v. Riskeard and Another* (1911, 2 K.B., 846).

EXTRAORDINARY TRAFFIC.—"Cambria" writes: A colliery company in this district were in the habit for many years of carting coal along a by-lane, about ¼ mile in length, to a railway station. The carting was done by means of horse-drawn wagons, travelling singly or in pairs. About two years ago they discontinued the use of horse-drawn vehicles, and substituted large trucks, drawn by heavy traction engines, which have cut up the lane very badly, necessitating heavy increased expenditure in its repair. Will you oblige me by stating whether, in your opinion, the highway authority can legally claim payment of extraordinary traffic expenses from the company? There was no other heavy motor traffic on the lane during the two years.

In my opinion the highway authority are legally entitled to recover from the company the additional expenses incurred in repairing the lane by reason of damage done by the traffic in question within twelve months before the commencement of proceedings. In order to enable them successfully to maintain their claim, however, it will be necessary for their surveyor to give a certificate, stating that, having regard to the average expense of repairing highways in the neighbourhood, extraordinary expenses have been incurred by the authority in repairing the lane by reason of damage caused by the traffic referred to. The certificate should set out all the facts in detail. It is a necessary preliminary to the proceedings, and should be very carefully prepared.

FOOTPATH CROSSING STREAM: FLOODING. "E. M." writes: An old public footpath crosses a stream, and an earthenware pipe has been laid to convey the water under the path. In times of heavy rain the water flows

The Surveyor
And Municipal and County Engineer.

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over the path, owing to the stream becoming silted up and (or) the pipes being too small. The owner of land higher up the stream has suffered damage by flooding. Will you please say if the owners or occupiers of land abutting the stream are liable to cleanse the silt from the bed of the stream and put in a larger pipe under the path, also for damage caused to the owner of land flooded, and for damage to the path, or are the council liable?

In order to express a decided opinion as to this, it would be necessary to know by whom, when, and under what circumstances the pipe was laid under the footpath, and whether the floods are due to its interfering with the natural flow of the stream. Upon the bare facts stated in the query, I think it is very doubtful whether either the owners or occupiers or the council are liable.

Birmingham Town-planning Schemes.—An amending scheme for a portion, 247 acres in extent, of the East Birmingham area (1,443 acres) has been drafted and submitted for the approval of the Local Government Board. A revision of the draft map and scheme of the North Yardley area (3,176 acres), which embodies an area within the Meriden Rural District, is in preparation, and it is hoped very shortly to be able to submit the final scheme to the board. The tentative proposals of the committee with reference to the South Birmingham scheme (8,400 acres) have been submitted to all owners concerned and interested, and the draft scheme map and ownership map are nearing completion for early submission to the board. A reference of ownerships and revision of the Ordnance Survey of the South-West Birmingham area (9,200 acres) is well in hand, in view of an early application to the board for permission to prepare a scheme. The future improvement of the arterial roads and other main thoroughfares of the inner area of the city, and a possible remodelling of these with a view to their ultimate reconstruction, together with the consideration of all kinds of traffic facilities, will receive consideration during the year.

CORRESPONDENCE.

Εἰς ἀνὴρ οὐ πάνθ' ὁρᾷ

(One man does not see everything.)
—EURIPIDES.

PIGSTIES: THEIR ERECTION AND CONTROL.

To the Editor of THE SURVEYOR.

SIR,—An article in THE SURVEYOR on "Pigsties" would at the present moment not only be interesting but useful.

"We must relax our by-laws with respect to pigsties," said my chairman over the 'phone, and he was considerably surprised that the word "pigsties" could not be found in those by-laws. Some sets certainly do deal with nuisances caused by the keeping of swine.

If a pigsty be a "domestic building" within the meaning of the by-laws, the question of "site" and "sufficiency of air space" would appear to be involved.

Unless proper drainage can be provided, the question of "cesspools" arise. By-laws usually require them to be placed 50 ft. to 75 ft. from dwelling-houses, well, &c.; their method of construction is definitely set out—a wicked waste of good material where a piped water supply exists.

"There is no prohibition in law as to pigsties," we read.

"The keeping of swine in a city is a nuisance at common law."

"In urban districts by-laws may be made regulating pigkeeping."

"Rural authorities, even though armed with urban powers, (?) may not attempt the regulation, generally, of pigkeeping."

"A by-law prohibiting the keeping of swine in a rural district was held to be unreasonable and bad."

Sec. 91 (3) of the Public Health Act of 1875, says: "Any animal so kept as to be a nuisance *or* injurious to health" shall be deemed to be a nuisance, liable to be dealt with in manner provided by the Act." Sec. 47 prohibits the keeping of swine *in* any dwelling-house within an urban district, but there appears to be no such restriction with respect to a rural district. The fact remains, however, that no person has any legal right to commit a nuisance, and if he does commit or permit one, he can be punished.

In order efficiently to control the erection of pigsties, plans should be demanded, otherwise they will occasionally be erected under a neighbour's bedroom window, or actually abutting on the highway, on ground the configuration of which is such as must permit an overflowing cesspool to cause a nuisance. They might be classed as "temporary buildings," thus permitting their construction of wood. An impermeable floor of hard brick or concrete, and a small watertight cesspool, should be a minimum requirement.

The Board of Agriculture leaflet, No. 121, contains many useful hints, and No. 298 gives a plan.

Better not build at all than face them north or east.

Pigs do not thrive unless you can keep them warm.

They should not be in pairs; the warm corner should in every case back north and east.

A few headers left out of the wall during construction gives ample ventilation, and a handful of straw stuffed in the holes during bad weather prevents draughts.

Three feet is not high enough for the walls—they should be 3 ft. 6 in. to 4 ft.

Troughs should be accesible from the outside; but, when a split drain-pipe, set in concrete, makes the best type, why purchase fireclay?

Why the extra cost of brick on edge, when even 1-in. thick quarries, of wastrel quality, make an excellent floor?

If concrete is used, herring-bone it with grooves to assist drainage.

Two inches fall in 7 ft. I would double it.

Keep the floor well above outside ground level. I prefer a 3-in. step-up into the bed, and a few old boards for a mattress—a well-behaved pig seldom fouls the bed.

A bit of spouting, if only of wood, along the eaves of a lean-to roof prevents half the rain-water from entering the cesspool.

The rail for the breeding-sow may be provided for by leaving out headers at each corner; through the holes a wooden rail can be inserted and withdrawn.

For a cesspool, obtain an old iron drum or a defective 12-in. or 15-in. sanitary pipe, set on a 3-in. bed of

concrete, with a similar band round the outside, socket up, wooden lid roughly fitted. The frost will crack the pipe, the iron drum will soon rot away, but the concrete is practically everlasting.

Much more might be said. All sounds very exacting, but it all tends to simplicity, cheapness and efficiency.—Yours, &c.,

T. H. NEGUS,
District Surveyor, Meriden R.D.C.

Coleshill.
Birmingham.
January 16, 1917.

SURVEYORS AND COTTAGE DESIGN.

To the Editor of THE SURVEYOR.

SIR,—Your correspondent, "Local Surveyor," in your issue of the 12th inst., accuses me of having made a most unjust attack upon the general body of surveyors and local authorities in stating in a recent lecture that the surveyor to a local authority is not qualified to undertake the design of cottages.

Should I be elevating the architectural profession if I said that its members found the practice of architecture so easy of attainment that they were also able to undertake road construction, and the design and superintendence of all the works attendant upon the laying of a big sewer? To do so would mean that I attached more importance to the opinion of a jack-of-all-trades on a specialised question than to the opinion of an expert.

I see no reason for detracting from what I have said, and this in view of the very high opinion I have of the professional qualifications of the surveyor.

The practice of cottage building, viewed from its constructive, economic and artistic aspects, is one that demands a special training, and thus the training of an architect; and to the surveyor, versatile as his peculiar office tends to make him, work demanding a knowledge of the details of architecture must necessarily be more or less obscure.

No doubt there are a few surveyors, and your correspondent may be one of them, who are better architects than surveyors; there are certainly architects who have mistaken their calling. Exceptions and misnomers occur everywhere.

But we must remember that, while the general education of members of all the professions will in the future need to be broadened and improved, superimposed upon a good general education, the professional practitioner will, if he is to attain that proficiency in his profession which the future will demand of him, need to specialise more.

The surveyor to a local authority (would that he always knew it!) may claim to belong to perhaps the most important of the technical professions; to be an expert in the provision of all the services of a municipality, and on subjects varying from the laying down of a comprehensive town plan to questions relating to the effect of varying atmospheric conditions on road crusts, to say nothing of the business qualifications, tact and diplomacy that are so necessary in the realisation of schemes. To hold such qualifications and use them successfully is surely sufficiently difficult, without adding architecture and poaching upon other professional preserves.—Yours, &c.,

S. D. ADSHEAD.

46 Great Russell-street, W.C.
January 17, 1917.

Bristol Road-tarring Costs.—The city engineer, Mr. L. S. McKenzie, reports that the total area of roads in Bristol treated with tar last season amounted to 1,510,777 super. yds., as compared with 1,483,133 yds. the previous year. Of this, 635,344 yds. was done by corporation men by hand and machines, and the balance executed under contract. In addition, two coats of tar were applied to 40,286 super. yds. The cost of the work was 1.52d. per yard, as against 1.53d. the previous year.

Bolton Waterworks Bill.—Strenuous opposition is to be offered by the urban district councils of Turton, Farnworth, Kearsley, Little Hulton, Worsley, Westhoughton, and Bartlam-cum-Trafl to the Waterworks Bill which the Bolton Corporation is promoting in the next session of Parliament. The Bill, which involves an expenditure of £2,500,000, is to provide four new reservoirs in the valleys of Hindburn and Roebourn, to ensure a century's water supply for Bolton and district. All the authorities represented in the opposition obtain their water from Bolton, and opposed the Bolton Waterworks Bill in 1905.

SCOTTISH NOTES.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Scottish Notes," 24 Bride-lane, Fleet-street, E.C.]

Housing and Town Planning. At a housing and town planning conference held in Glasgow in November last, it was again and again strongly urged on local authorities to proceed with town-planning schemes *now*, so that at the end of the war there might be found suitable and sufficient work for members of the building and allied trades now serving with the Colours. In a recent issue of the *Glasgow Herald* it was stated that the town-planning scheme prepared by the City of Dunfermline had been in the hands of the Local Government Board—for final approval—since August, 1915. If the oft-expressed wish of the leaders of the above conference is to be realised, and if town-planning schemes are to be of any benefit at the conclusion of hostilities, it is to be hoped that the experience of Dunfermline will not be repeated. Admitting that the energies of the staff of the Local Government Board have been absorbed on war work, some way out must be found, and some speeding up resorted to, otherwise there is little hope of meeting the urgent demand for housing accommodation which undoubtedly exists in Edinburgh, Dunfermline, Clydebank, Mid-Lanark, and other Scottish centres. Meantime there is a danger of the Town Planning Act becoming—for all practical purposes—a dead letter.

* * * *

Experimental Roads. In the spring of 1913 there were laid down in several districts of Scotland experimental stretches of roadway, constructed according to a specification agreed upon between the Road Board and the Scottish branch of the Institution of Municipal and County Engineers. The supervision was undertaken by the engineering staff of the Local Government Board, and a report on the trials was to be issued to members of the institution. The writer has seen several of the roads, but the profession as a whole are not aware of the results. In view of the fact that many local authorities have practically ceased road operations during the war, and that a large amount of work will require to be done on its termination, it would be of very great value to surveyors if the report referred to were now forthcoming.

* * * *

Public Works in Contemplation. Recently the Board of Trade invited local authorities to inform the board of public works which were likely to be undertaken at the close of the war. From the reports of town and county council meetings appearing in the public Press, it would appear that a large amount of useful work is contemplated, but it is to be feared that, with the despatch of the returns to the board, the matter will in many cases be, for the present, lost sight of. If this should prove to be correct, it will indeed be unfortunate. All over the country rigid economy in the expenditure of public money is being insisted on. Responsible officials should therefore seize this period of comparative quiet to mature their schemes, so that when work is urgently required valuable time will not have to be lost in the drawing office. Burgh engineers will be well advised to formulate their "after the war work" now, so that delay may be reduced to a minimum.

* * * *

Sizes of Sewers. In connection with a large housing scheme, there was recently submitted to a town council for their approval a drainage scheme in which a number of sewers were shown at 6 in. diameter. On the recommendation of the surveyor the council decided that no sewer laid in a street should be less than 9 in. diameter. In support of his case the surveyor stated that, while 6 in. might be theoretically correct, he had found from practical experience that it was too small, and on more than one occasion he had been obliged to remove sewers of this size—not on account of additional drainage being admitted, but by reason of the expense and annoyance caused by repeated choking.

One wonders what has been the experience of other surveyors.

* * * *

Ventilation Shafts. In connection with more than one housing scheme recently undertaken in Scotland, ventilation shafts have been left out of the separate house-drainage systems. The writer believes that the Dunfermline City Council were the first to allow this in connection with the operations of the Scottish National Housing Company at Rosyth. Might one appeal for a description of the methods adopted?

* * * *

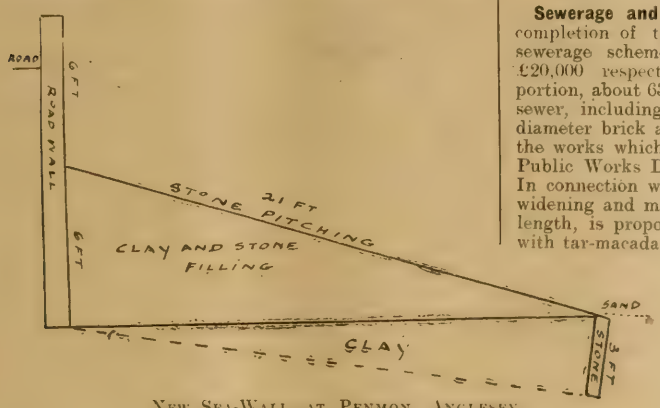
City Garden Allotments. The utilisation of uncultivated land for the production of food has been taken up with enthusiasm in Scotland. The matter has been under consideration by the majority of town councils, and in many towns it has been decided to plough up portions of public parks and pleasure grounds. The City of Edinburgh has given the matter a very great deal of attention. A large number of allotments have already been taken up, and, the demand still continuing, it has been decided to form another 2,000. Over 110 acres of derelict land within the city bounds are being set apart for this purpose. The Herriot Trust, the Hope Trust, and the Merchants' Company are also offering land for allotments. Mr. McHattie, the chief city gardener, has been a moving spirit in the matter, and is at present delivering a course of lectures on "Garden Allotments, and How to Work Them." With so many amateurs entering the sphere of agriculture these lectures will prove of very great value, and are well worthy of imitation in other centres.

AN ANGLESEY SEA-WALL.

By J. KERSHAW,

Surveyor to the Aethwy, Anglesey, Rural District Council.

The accompanying illustration is of a sea wall recently constructed at Penmon for the Aethwy, Anglesey, Rural District Council, under my supervision and from my design. The plan has been made to suit the place, as it is extremely exposed, and in rough times the sea is very heavy. It will be observed that the wall is 12 ft. high; in spite of this, the sea



NEW SEA-WALL AT PENMON, ANGLESEY.

is sometimes capable of throwing stones over into the road.

I think it will be agreed that the plan is quite original. The usual contention is that pitching should come to a diminishing point, but the head stone has been substituted, embedded in the clay. The object is that, in case of further erosion, sufficient warning will be given by the exposed stone, while a continuation could easily be carried out into the shore, and the head stone would be a stronghold between the old and new section.

Allowances to Municipal Employees on Service.—In regard to corporation employees who have joined the special corps of the Royal Engineers for road construction in France, it has been decided by Brighton Town Council to grant them war allowances sufficient to bring their Army pay and separation allowances equal to their civil pay at the time of enlistment.

HUDDERSFIELD MUNICIPAL PROJECTS.

PROPOSED EXPENDITURE OF £957,000.

The Corporation of Huddersfield have in contemplation several extensive and important works, some of which are of an urgent nature, particularly those relating to the housing question. Owing to the operations of British Dyes, Limited, and Messrs. L. B. Holliday & Co.'s new works, and the establishment of a Government factory, there has been a great addition to the population of the borough, and it is absolutely essential that something should be done at the earliest possible opportunity to provide housing accommodation for these people. The corporation received in 1913 the sanction of the Local Government Board for the borrowing of the money for the erection of working-class dwellings, but, owing to the restrictions imposed on local authorities in regard to expenditure, works have had to be suspended. The matter has become so serious, however, that it has been decided by the town council to ask the Ministry of Munitions to receive a deputation, in order to obtain, if possible, the necessary consent to proceed with the erection of a number of dwellings to meet the special circumstances. The following is a list of the works contemplated, most of which are of an urgent character—viz.:—

Highways.—Improvements and paving of main roads, £110,390; main road from Johnny Moor Hill to Milnsbridge, £42,000; Northumberland-street, extension to Leeds road, £14,000; new road from Ashgrove-road to Dalton Bank, £42,500; total, £208,890.

Sewage Disposal Works.—Extension, £150,000.

Sewers.—New sewers, &c., in connection with British Dyes works and subsidiary sewers, £94,950.

Tramways.—Doublings and renewals, £87,418; extension to Brighouse, £63,000; extensions at Longwood, Crosland Mill, Dalton, Ramsden-street, trackless cars from outlane to borough boundary, £60,000; total, £210,418.

Private Street Works.—New streets, £3,000.

Housing.—Working-class dwellings, £250,000.

Public baths and laundry, £16,000.

Education.—Extensions to girls' high school, £6,500; open-air school, £5,300; new elementary school, £12,000; total, £23,800.

Aggregate total, £957,058.

Sewerage and Road Works at Birmingham.—The completion of the Griffins Brook and Hall Green sewerage schemes, at a total cost of £16,000 and £20,000 respectively, and the reconstruction of a portion, about 633 yds. in length, of the Hockley main sewer, including the construction of 9-ft. and 10-ft. diameter brick and concrete barrel sewers, are among the works which it is proposed that the Birmingham Public Works Department shall carry out this year. In connection with road work, the completion of the widening and making up of Drews-lane, 1,100 yds. in length, is proposed, other projects being the coating with tar-macadam of a further length of about 3 miles of the carriageway of Bristol road, the paving with Leicestershire granite setts of the carriageway in Lawrence-street, and the construction of a small bridge over the River Rea at King's Norton.

Municipal Work at Douglas.—Judicious economy will be observed at Douglas, Isle of Man, during the present year, and no new or contemplated public works necessitating a large expenditure will be undertaken. Alien labour from the local detention camp is to be employed in quarrying, stone-breaking, and tarring, and in the resurfacing of many miles of roads in the borough. These road surfaces have not been extensively repaired during the war, but it is now proposed to restore them to their former condition, tar-macadam, tar-spraying, and tar-grouting being more extensively used. The cultivation of the Playing Fields, Villa Marina, the Pulrose estate, and several fields belonging to the corporation is being undertaken, and in places free allotments for the production of vegetables are being granted to ratepayers. The waterworks plantations are being improved with the further planting of considerable areas of the water-shed. The public baths, we are informed by the acting borough engineer and surveyor, Mr. A. D. Barron, are being altered for a special purpose, but part will be retained for public baths purposes.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Grimsby T.C.—The town council have decided to purchase 5 acres of land at Scartho, at £100 per acre, for the erection of a tuberculosis hospital. The mayor said that the land would be paid for out of revenue, spread over two half-years' rates.

HOUSING AND TOWN PLANNING.

Annfield Plain U.D.C.—A letter has been received from the Local Government Board in reference to the proposed scheme for the erection of 100 new workmen's houses at Dipton, suggesting that the council should submit the proposal as early as possible, so that official sanction could be obtained and the work proceeded with when the conditions were favourable. A committee of the whole council was appointed to inspect the land and fix upon a suitable site.

Barnsley T.C.—The borough surveyor, Mr. J. H. Taylor, reports that, owing to the discontinuation of building, there should be provided 500 or 600 houses. An early meeting of the town council is to be held to consider the matter.

Bristol T.C. — The city surveyor, Mr. L. S. McKenzie, submitted recently to the Sanitary Committee a report with reference to new works which are being constructed in the vicinity of the city. He pointed out that these would probably lead to the erection of a large number of workmen's dwellings, and he asked the committee to consider whether it was desirable that a town-planning scheme should be prepared for the undeveloped land likely to be developed. If that was done, it would lead to this new suburb being treated according to modern ideas, and it would prevent any repetition of the deadly monotony of workmen's houses such as had been built in the past. The committee thanked the city engineer for his report, and requested him to prepare a scheme under the Housing and Town Planning Act.

Dundee T.C.—The Housing and Town Planning Committee on Monday considered the question of a town-planning scheme at Clepington. In the course of the discussion it was stated that if a housing scheme were entered upon care must be taken not to burden it with the cost of slum property demolished. It was intimated that the city engineer, Mr. J. Thomson, would submit a report and scheme in the near future, and that the idea was to have all the preliminary arrangements matured against the end of the war.

Glasgow T.C.—The city council last week discharged Bailie Drummond and the town clerk's committee on housing and referred to the Special Committee on Housing and General Town Improvement their report, in which they asked for power to select on ground belonging to the corporation a site or sites suitable for the erection of dwelling-houses, and prepare plans of the houses proposed, reserving for determination later the borrowing powers to be exercised and the time when the erection of the houses should be proceeded with.

Hendon R.D.C.—In view of expected building developments after the war, the council are making application to the Local Government Board for a town-planning scheme embracing the parishes of Great Stanmore, Little Stanmore, and Edgware.

Kilwinning T.C.—The town council have formed themselves into a committee for the promotion of a housing scheme for the burgh.

Romford R.D.C.—The council are applying to the Local Government Board to sanction a town-planning scheme for Northwood Hemstead and the village of Hornchurch.

MOTOR TRANSPORT.

Accrington T.C.—It is proposed to purchase another motor waggon for the Health Committee.

Barnsley T.C.—Owing to the difficulty of obtaining a motor fire engine, and the refusal of the Local Government Board to sanction a loan, it has been agreed as an emergency to purchase two motor cars for the use of the fire brigade, at a cost not exceeding £500, to be paid out of revenue.

Cheadle and Gatley U.D.C.—Particulars are being obtained of suitable motor tractors for highway and fire brigade work.

ROADS AND MATERIALS.

Banffshire C.C.—The Upper Banffshire District Committee have appointed a committee to consider the question of constructing a road to Corhabbie, Glenrinnes.

Oavan C.C.—At the meeting last week a report was submitted by the county solicitor on the prosecution of road contractors. Commenting upon this, Mr. F. M'Govern, J.P., stated that there were roads in such a neglected state that it was not safe to drive a donkey cart over them. It would be a godsend to get rid of the bad contractors, and the only way to deal with them was by putting the law in motion. It was becoming quite a practice for men to tender for roads to cut out somebody else, to neglect the work, and then make a canvass of county councillors and district councillors to prevent a prosecution.

Cookstown (Co. Tyrone) R.D.C.—The county surveyor, Mr. J. W. Leebody, asked for an expression of opinion regarding a scheme of direct labour. Dungannon Council had, with one dissentient, agreed to consider a scheme if formulated by the county council, and he asked Cookstown to do the same. He proposed to deal only with leading roads, and he divided the district into five groups. On each group he proposed to have a foreman and staff, and the total expenditure would be limited by the amount at present spent in maintenance. All the roads would be offered for contract, and if a suitable contractor could be obtained the council would accept the tender, but if not the road would be maintained by direct labour. After discussion, the council by eleven votes to nine declined to ask the county council to formulate a scheme.

Cornwall C.C.—The county surveyor, Mr. L. D. Thompson, has been authorised by the Highways Committee to arrange for the supply of German prisoners for quarrying and road work. In reply to a question as to the rate of wages to be paid to the men, it was explained that the employers would pay full market wages, and that the balance would go to the military authorities.

Derry C.C.—The council have approved of resolutions from rural district councils asking for the sanction of the Local Government Board to the increasing of the limits of road expenditure. The increases sought were: Coleraine, from £8,868 to £9,200; Limavady, by £500; Derry No. 1, by £900; and Magherafelt, £800—all for a period of three years.

Enfield U.D.C.—The deputy surveyor, Mr. T. Briscoe, reports that with two exceptions all the owners of property concerned have agreed to give up the land necessary for the widening of Ordnance-road, and he was instructed to proceed with the work as far as possible.

Forfarshire C.C.—It was stated at the Forfar District Committee meeting that the committee had agreed to release every possible roadman in their employment for road-making service in France. Inquiry had been made whether in that event the Road Board would be prepared to make a grant towards the cost of restoring the roads after the war was over, but no reply had been received. In the interval the rate of wages offered had been reduced from 3s. to 1s. 8d. for men of military age. In these circumstances it did not appear as if there was any special urgency in the matter. The committee authorised the surveyor to lend any road-making plant that was to spare and to await further inquiry regarding the request for the services of the roadmen.

Margam U.D.C. — The chairman, Mr. Edward Lewellen, reported that he had seen the manager of the Road Board in London relative to the new Avon Valley road, and had emphasised the necessity of through communication between Glyncorrwg and Port Talbot. The manager informed him that the Road Board would raise no objection to the council proceeding with the work of linking up the council's portion with the new portion constructed by the Glyncorrwg

Council. The surveyor, Mr. John Cox, reported that the county surveyor had applied for £500 from the Road Board on further account of the work.

Norfolk C.C.—The Western Highways Committee have adopted a similar course to that agreed to by the Eastern Highways Committee on the subject of a war bonus to the district road surveyors—viz., to allow a bonus of £10 a year, with a further £10 a year for travelling expenses, for the duration of the war.

Northants C.C.—The council have approved a scheme prepared by the county surveyor, Mr. C. S. Morris, for the improvement of the four cross roads at Finedon, at an estimated cost of £250.

Scarborough R.D.C.—Correspondence has been received from the North Riding County Council as to a proposed new road from Cayton to Folkton. The Highways and Bridges Committee were of opinion that the improvement was a desirable one for the neighbourhood and was much needed. They were of opinion that the road in question should be constructed to a width of 16 ft., and that the making of the road be left in the hands of the county council, the rural district council agreeing to take over and maintain the highway after it had been suitably constructed.

Totnes R.D.C.—It has been agreed to ask for the services of twenty German prisoners on the roads.—A committee has been appointed to consider the appointment of a surveyor in the place of Mr. H. Vickery, resigned.

Welton R.D.C.—The Highways Committee reported that the appeal tribunal had decided to grant the surveyor (Mr. W. Starkie) exemption from military service to February 1st, and it was resolved that during his absence on military service the district councillor for each parish be authorised to supervise the repair of the highways in the parish and the manual and team labour thereon. It was also resolved that the surveyor's books be kept by Mrs. Starkie at a salary to be hereafter fixed, and that the working of the steam rollers, the ordering of road material, and the general supervision of the highways in the district be done by a sub-committee. Mr. R. Sergeant, however, contended that councillors could not overlook their own parish. He proposed they advertise for a temporary surveyor. After some discussion the proposition to advertise for a temporary surveyor was carried by fifteen against six, and it was decided to offer a salary of £100.

SEWERAGE AND SEWAGE DISPOSAL.

Southampton T.C.—The borough engineer, Mr. J. A. Crowther, has received instructions to report on the possibility of protecting Northam from flooding by storm-water, sewage, and abnormally high tides.

Staffs C.C.—The county medical officer has advised the county council to press upon the district council of Amblecote the necessity for an improved method of refuse removal and the termination of the present contract system, and the provision of a mortuary and disinfecting apparatus.

Tredegar U.D.C.—The accountant (Mr. A. P. J. Gough) submitted an account of the district sewerage scheme as computed by the contractors, Messrs. Baines, Chaplin & Co. The tender was £24,912, and the estimated mileage 23 miles 440 yards, the estimated cost being £1,071 per mile. The amount of additional work was £514. The loan sanctioned was £31,000, and the total paid to the contractors was £23,459. The balance left for house connections was £7,544, the amount spent on house connections up to December 1st being £2,916, leaving a balance unspent of £4,623.

Wath R.D.C.—Specifications are being prepared by the sanitary inspector of an improved sewerage system for Rainton.

WATER, GAS, AND ELECTRICITY.

Dublin T.C.—The chairman of the Electricity Supply Committee stated that, despite restrictions and increased cost of material, they were able during the last financial year to pay off £32,000 of capital, £24,000 in interest, and make a nett profit of nearly £9,000.

Exeter T.C.—With reference to the notice from the Board of Trade, substituting "calorific power" for "illuminating power" in the public gas lighting, the Lighting Committee have resolved that the Board of Trade be requested to provide in the Order that a gas examiner appointed under the Gasworks Clauses Act, 1871, for the purposes of the Order may at the prescribed testing place, or at any public lamp as and when he thinks fit, test the pressure at which the gas is supplied, and that the company shall afford to the examiner all reasonable facilities for making the test.

Llandudno U.D.C.—The council have approved a recommendation of the Gas Committee that in future the manager of the gasworks, Mr. M'Gregor, should be given full control of all gas mains and services in the town, and that he be instructed to take steps with a view to ascertaining the cause of the excessive amount of unaccounted for gas and of reducing the loss thereby caused. During the year ended on March 31st last the gas unaccounted for amounted to 12·4 per cent of the "make," as compared with 9·7 per cent in the previous year.

Penistone R.D.C.—An intimation has been received from the Penistone Urban District Council of their intention to increase the price of water supplied by them to the rural council, and to the Darton Urban Council from 6d. per 1,000 gallons to 7½d. per 1,000 gallons, on account of the increased outlay incurred in providing a water supply. The agreement has still six years to run, and the rural council see no reason why the price according to agreement should not be adhered to. It was decided to defer the matter for a month in order to ascertain the opinion of the landowners in the area.

Standish, Lancs, U.D.C.—The council have agreed to obtain expert advice on the water supply, the normal supply having been seriously affected after a breakage in the mains.

Swansea T.C.—The Water and Sewers Committee have authorised the engineer to purchase and fix water meters up to an amount not exceeding £1,000. The committee recommend that a pumping plant be installed in Carmarthen-road for the purpose of pumping water, if necessity arises, from the low-level supply to the high-level supply. The estimated cost is £1,000.

Truro T.C.—The council have accepted the offer of the gas company, at £1 2s. 3d. per lamp, for public lighting.

Weymouth T.C.—The Electricity Committee have received authority to spend £500 on electricity extensions.

MISCELLANEOUS.

Hythe T.C.—With reference to a proposal to spend out of revenue £420 in preparing and planting beds of shrubs on the canal bank, placing a new ornamental iron fence on each side of the Ladies'-walk, shrub planting in that thoroughfare, and hedge planting in The Grove, it was stated that the Local Government Board had written asking for the observations of the town council on a letter sent by a town councillor raising objections to the scheme. The mayor now stated that the town council having agreed by a majority to go on with the work, he would, if they would allow him, pay for such work by advancing the money, without any interest, the sum to be repayable after the war, when they reached normal times of peace again. As a business man, they might take his word for it that the cost would be far greater after the war than now.

Norfolk C.C.—The county surveyor, Mr. W. W. Gladwell, reports that the repairs to roads are being carried out as expeditiously as possible with the labour available. There are 114 fewer men employed upon the roads than at this time last year, and, in consequence, work other than that appertaining to repairs has had to be practically abandoned. One-fourth only of the orders for granite have been completed, and the shortage on gravel deliveries is also considerable. Great difficulty is experienced in obtaining carters. The roads are appreciably suffering from these causes, and the heavy traffic to which they are being subjected. Four of this council's district surveyors and 140 steam-roller drivers and roadmen have enlisted. Two of the latter have been discharged as being medically unfit, four are reported missing, and eleven have been killed. The total number of surveyors and men from the county who have enlisted and will be transferred to the new road service from the units to which they are now attached, and those who have volunteered is as follows: Norfolk County Council, 11 surveyors, 156 men; urban and rural authorities, 9 surveyors, 91 men; other sources, 86 men; total 20 surveyors, 336 men.

Rhyl U.D.C.—It was stated at the council on the 8th inst. that a large quantity of the sand drift has

been arrested by the planting of marram grass, and that the storm had not affected the planted area very much. Letters were read from property owners consenting to the planting of the grass in front of their houses. Regarding the sea defences, a report was presented by the surveyor, Mr. A. A. Goodall, who warned the council that if erosion takes place during the next six months, as at present, there will be serious trouble in the west end. The council thereupon decided to call a special meeting to deal with the matter. The Board of Trade had already been approached on the subject of coast erosion, but they replied they had no funds to deal with the matter, and referred the council to the Development Commissioners.

PERSONAL.

Mr. Percival H. Audsley, building surveyor to the Dewsbury Town Council, has been gazetted Second Lieutenant.

Mr J. H. Castle, surveyor to the Goole Urban District Council, has been granted a commission in connection with the Roads Battalion.

Captain J. N. Prior, Royal Engineers, sanitary inspector to the Sevenoaks Rural District Council, has been awarded the Military Cross.

Prof. E. R. Matthews, ASSOC.M.INST.C.E. (Captain R.A.M.C., C.O. Sanitary Company, 17th Division), has been elected a Membre Société des Ingénieurs Civils de France.

Mr. W. Truscott, acting surveyor to the Liskeard Rural District Council, having received final exemption by the tribunal to March 31st, the council have decided to advertise for a successor.

Mr. E. L. Lunn has been unanimously selected by a special committee of the corporation to act as borough surveyor and engineer of Guildford during the absence in France of the borough surveyor, Mr. E. Young Harrison.

Mr. A. Courtney Groves, surveyor to the Newhaven Rural District Council, met with a motor-cycle accident recently, colliding with a horse and cart. He was taken to the Lewes Victoria Hospital, and afterwards conveyed home, where he is making a good recovery.

Mr. John Fawcett, the sanitary inspector, has been appointed surveyor to the Blyth Urban District Council, in succession to Mr. R. Grieves, resigned, and Mr. J. Backhouse, the assistant sanitary inspector, has been promoted to the post of sanitary inspector.

Lieutenant A. W. Edmett, Royal West Kents, to whom reference was made last week, was an assistant in the office of the Slough urban surveyor when he joined the Army (not assistant surveyor). He received his wound not in the first advance on the Somme, which commenced on July 1, 1916, but on September 15th.

Mr. A. C. James, engineer and surveyor to the Grays Urban District Council, and Mr. S. A. Hill-Willis, engineer and surveyor to the Tilbury Urban District Council, are to supervise the disposal works of the Thurrock, Grays and Tilbury Joint Sewerage Board, on alternative months, while the manager, Mr. Holgate, is away on military service.

Mr. E. Young Harrison, borough surveyor of Guildford, has been granted a commission as Captain in the Royal Engineers, to command one of the Road Construction Companies now being formed to take over the road work in France. Mr. Harrison is to command the Surrey Company, and anticipates that when he goes to France members of his own staff who are already serving there with the Labour Battalions will be enrolled under him.

Second Lieutenant D. Higgins, London Regiment, the assistant surveyor to the East and West Molesey Urban District Council (who was awarded the Military Cross), is now in a London hospital, where it is hoped he will make good progress after his second operation. It was stated at a meeting of the council that the surveyor, Mr. J. Stevenson, said he had endeavoured to ascertain for what particular act of bravery the cross was awarded, but Lieutenant Higgins declined to disclose this, saying he merely carried out orders. "That is the true hero's spirit," said the chairman.

Mr. S. H. Newsome, an assistant surveyor in the Sheffield city surveyor's department, has received a commission in the Royal Engineers. Mr. Newsome, who has been in the Army for several months, is the third assistant from the department who has received a commission in one or other of the engineering units. Lieutenant Brierley (divisional surveyor) and Lieutenant Hassall (chief assistant, sewers department), each of whom has seen service in Gallipoli and in France, have been wounded in recent advances, and Mr. Brierley is a patient at the Third Northern General Hospital. Five members of the city surveyor's outdoor and clerical staff have been appointed non-commissioned officers in the new Road Corps.

Private R. Emsley, one of the workmen at the Hove Corporation cemetery, has been awarded a bar to the Military Medal already bestowed upon him for conspicuous gallantry and untiring devotion to duty displayed at the Schwaben Redoubt during the operations of October 21, 1916. Private Emsley, who was a stretcher bearer, worked untiringly, frequently under heavy shell fire, removing wounded in the area behind the captured German line. He then went to the captured position and brought wounded away. Seeing that the numbers were more than the regimental stretcher bearers could cope with, he personally went to the advanced dressing station and brought R.A.M.C. bearers back. He showed them where the wounded were, and it was largely owing to his devotion to duty that, when this battalion was relieved in the night, all wounded had been evacuated from the captured trench. He continued to work until completely exhausted, and was a striking example of devotion to duty to his comrades. He had been awarded the Military Medal for a similar act of gallantry.

OBITUARY.

The late Mr. F. W. Manuelle, head of the firm of A. & F. Manuelle, granite merchants, left property of a gross value of £79,369.

Lieutenant J. H. Taylor, son of the borough surveyor of Barnsley, has been killed in action, we regret to state. At the meeting of the town council last week a vote of condolence with Mr. Taylor and family was passed.

Mr. John Swift, surveyor to the Penistone Urban District Council for twenty-six years, died somewhat suddenly last week, at the age of sixty-two. Mr. Swift's youngest son, Private Charles Edward Swift, was killed in France in September, and this had been a sad blow to the father.

Mr. Herbert Batsford, managing director of the well-known firm of architectural publishers and booksellers, B. T. Batsford, Limited, High Holborn, died somewhat suddenly at his residence at Golder's Green on the 14th inst., after an illness extending over nine months. Mr. Batsford was the last surviving son of the late Mr. Bradley Thomas Batsford, the founder of the business, with which he has been connected for over thirty-five years. He was associated on the board of directors with Mr. Harry Batsford, his nephew, and Mr. W. Hanneford Smith, who have both been engaged in the direction of the business for many years, and will in future carry on its work.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATIONS FOR LOANS.

Dublin T.C.—£100,000 for extensions of the electric light system, and £12,600 for the utilisation of the tramway system in the conveyance of refuse, and the provision of a depot.

Listowel R.D.C. £1,000 for the construction of the Ballegan road.

LOANS SANCTIONED.

Derry C.C. £10,000 for the repair of damages to roads and bridges by floods.

Kettering U.D.C. £950 for the purchase of a motor fire engine.

LOANS REFUSED.

Holland C.C. £1,700 for a steam motor tractor and trucks.

Southend T.C.—£328 for proposed surface-water drainage works.

FORTHCOMING INQUIRY.

FEBRUARY. £

1.—**St. Annes-on-the-Sea.** For the construction of open-air sea-water baths and laying out Ashton Gardens (Mr. A. G. Drury) 16,934

DISPOSAL OF DESTRUCTOR WASTE SCRAP.

A PROFITABLE INSTALLATION AT HORNSEY.

A hydraulic pressing plant for baling tins has been installed at the sanitary depot of the Hornsey Town Council, and an interesting and instructive report dealing with its operation and the disposal of the waste metal has been prepared by the borough engineer and surveyor, Mr. E. J. Lovegrove, M.INST.C.E.

The estimated cost of providing the press and shed, with connection to existing accumulator and constructing an open firing hearth for burning the tins, was £150, and the work has been carried out within this amount; but a specially designed furnace has been built in lieu of the firing hearth for burning off the tins and the collection of solder dross. In connection with this question, Mr. Lovegrove refers to the arrangements made for, and the income derived from, the disposal of waste scrap before the war, during the first two years of the war, and to date. Up to the year 1912 the waste metal was removed by a British firm, Messrs. Henry Levin, Webb & Co., the highest annual receipts amounting to £113 for 197 tons. During 1912 an alien enemy firm secured the English market, removing the waste as under the previous contract, the highest annual receipts amounting to £136 for 194 tons. After the declaration of war the council discontinued to trade with this alien enemy firm, and complications ensued in the disposal of the waste; but, on communicating with Messrs. Levin, Webb & Co., arrangements were made under which the council removed the waste to their works, the receipts, after deducting the cost of cartage, falling, for the year 1915, to £74 for 201 tons.

It was then suggested by this firm that, if the council could deal with their own pressing and sorting of certain classes of scrap, an increased income would result and a regular market be controlled. The process suggested would, however, have involved additional labour, which would have been a somewhat heavy set-off against the profits. This has been obviated by the erection of the above-mentioned furnace, which is heated by the destructor flue gases, and arranged between the tipping platform and the press in such a way that the work is now being satisfactorily carried on without increasing the staff engaged on the old processes.

In the result the council were able to enter into a contract, as from October 1st last, for supplying, at advanced prices, to Messrs. Levin, Webb & Co. pressed de-tinned scrap, galvanised scrap, light waste and solder, the whole process of preparation, including refining of the solder, being carried out by the town council's own staff. "From the first three months' working it is evident," says the borough engineer, "that the committee's decision to deal with the work in this way has been fully justified, as the annual receipts for 194 tons will amount to £203. Notwithstanding the difficulty in disposing of the waste metal, the destructor yard has throughout been kept clear of accumulations, and it may now be said, in every sense of the term, that the trade has been secured, with an increase of about 49 per cent upon the returns received from pre-war German trading, and this by a simple process, involving no material encroachment upon the yard space or additions to the working staff, and at a comparatively nominal capital outlay."

Caerphilly's Projected Works. — Owing to the restrictions imposed, works other than necessary works are suspended at Caerphilly for the duration of the war. The council are promoting a Motor Omnibus Bill in the next session of Parliament. Immediately times are normal, owing to the industrial character of the district, a vast amount of new work will be taken in hand, among which may be mentioned the following—viz.: Public abattoirs, new council offices, various sewerage works, private street works, public improvement works, &c., in addition to the ordinary routine work of the district. The council, we are informed by the engineer and surveyor, Mr. T. H. Richards, are taking immediate steps to obtain land in various portions of the district for the cultivation of allotments under the Cultivation Land Order, 1916. During recent years the council have already obtained land—about 50 acres—which is laid out for allotments. The department, it should be added, is severely handicapped owing to the staff having joined the Army.

MUNICIPAL WORK AT PORTHCAWL.

AFTER-THE-WAR SCHEMES.

During the past twelve months the Porthcawl Urban District Council have carried out some important work, comprising a length of 8 miles of 8-in. water main from their Craig-yr-Aber reservoir to the service reservoir at Ty Coch (within their district), at a cost of £7,000, providing the town with a continuous supply throughout the year. An extensive sewerage scheme for the western portion of the district, comprising sewers ranging from 9 in. to 30 in. in diameter, and outfall works has also been completed, at a cost of £10,000. The consulting engineers for the two schemes were Messrs. John Taylor & Sons, Westminster.

A large portion of the esplanade on the sea front has been asphalted at an outlay of about £650. Further, new sanitary conveniences have been erected, extensive road repairs carried out, and nearly 90,000 sup. yds. of road surface tar-sprayed. A new road is being formed leading from the esplanade to Sandy Bay. It has become necessary to proceed with extensive repairs to the timber piers at the harbour, and these works are now in hand.

The council are proceeding with a scheme for the utilisation of waste paper, and the material is being collected daily and properly baled for disposal.

It is not intended to embark upon any new work until after the war, when a new sewerage scheme for the eastern portion of the town, several private street works, and additional sanitary conveniences and shelters will be proceeded with. The council have under consideration the adoption of a town planning scheme, and the preliminary work the surveyor, Mr. F. Hatcher, reports, is now being prepared.

The question of food production has received close attention, and land has been secured and is now being ploughed up for the allotment holders.

AN ALL-METAL BUNDLING PRESS.

The economical disposal of such materials as waste paper, leather, rags, tin chippings, and so forth, is a question that is daily growing in importance, and is one of particular interest to municipal engineering officials. The accompanying photographic views show the operation of an all-metal bundling press, manufactured by Messrs. Hollings & Guest, Limited, Thimble Mill-lane, Birmingham. The left-hand view

shows how the press can be used as a bin, and the other the interior of the machine after the waste material has been pressed. While it is claimed to be the most powerful hand-baler in the world, the labour required for its operation is extremely light. The press takes up very little room, and, being all metal, is fireproof; paper baled in it is said to be practically non-inflammable.

Municipal Work at Blackpool.—The corporation are promoting a Bill in Parliament in the session of 1917 for amalgamating the adjoining urban district of Bispham and part of the parish of Carleton with the borough. It is also proposed to carry out new sea defence works, about 2½ miles in length, and to construct two sea-water open-air swimming baths on the foreshore. A scheme is also being prepared to enlarge the main drainage of the borough as proposed to be extended, so as to prevent flooding in times of heavy rainfall and high tides. All work of street improvements and the making up of private streets—works urgently required—are necessarily being held up during the war.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

TEMPORARY ASSISTANT.—January 29th.—West Hartlepool Town Council. £120 per annum.—Mr. Nelson F Dennis borough engineer, Municipal Buildings, West Hartlepool.

WORKS FOREMAN.—January 29th:—Corporation of Leigh, Lancs. £2 per week.—Mr. W. H. Cowburn, town clerk, Town Hall, Leigh.

TEMPORARY ASSISTANT.—January 29th.—Somerset County Council. £120 with £20 for motor cycle.—Mr. Gordon R. Folland, acting county surveyor, Wells, Somerset.

WATER INSPECTOR.—January 29th.—Epsom Urban District Council. £2 2s. per week.—Mr. T. N. Young, engineer-manager, Waterworks, East-street, Epsom.

ROAD AND GENERAL FOREMAN.—February 1st.—Weymouth Town Council. £2 10s. per week.—Mr. F. Fernihough, town clerk, Municipal Offices, Weymouth.

TEMPORARY ROAD FOREMAN.—February 5th.—Merton and Morden Urban District Council. £2 15s. per week.—Mr. G. Jerram, engineer and surveyor, Council Offices, Kingston-road, Merton, Surrey.

TEMPORARY SURVEYOR AND INSPECTOR.—February 6th.—Ruislip-Northwood Urban District Council. £200 a year.—Mr. Edmund R. Abbott, clerk, Council Offices, Oaklands Gate, Northwood, Middlesex.

ENGINEERING FITTER.—February 8th.—Gosport and Alverstoke Urban District Council. £2 7s. 6d. per week.—Mr. H. Frost, surveyor, Council Offices, Gosport.

TEMPORARY CLERICAL ASSISTANT.—Office of a municipal engineer in the North-West of London. £3 3s. per week.—Box 1,602, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, London, E.C.

SANITARY INSPECTOR.—Government of Nigeria. £250—£300.—Crown Agents for the Colonies, 4 Millbank, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HALIFAX.—February 2nd.—For additions to a hospital kitchen, for the Board of Guardians.—Messrs. Clement Williams & Sons, architects, Post Office Buildings, Commercial-street, Halifax.

TETUAN (Morocco).—February 16th.—For building a market at an estimated cost of £7,000, for the authorities Spanish Protectorate, the "Junta de Servicios Locales," Tetuan, or the Morocco Section of the Ministry of State, Madrid.

Engineering: Iron and Steel.

MANCHESTER.—February 2nd.—For the supply and erection of two reinforced cooling towers, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall.

WOODFORD.—February 6th.—For the supply and erection of two 15—16 b.h.p. gas engines (Crossley, National, Stockport, or Tangye), and two Stereophagus pumps, at the eastern sewage works, for the Urban District Council.—Mr. W. Farrington, surveyor, Council Offices, Woodford Green, Essex.

FRESHWATER, I.W.—February 10th.—For repair of the [illegible] at the parish council.—Mr. J. Gilbert, clerk, Attabella, Heathfield-road, Freshwater, I.W.

BEDFORD.—For [illegible] at the electricity works, for the corporation.—Mr. R. W. L. Phillips, borough electrical engineer, Town Hall.

Roads.

WARRINGTON.—January 29th.—For the supply of [illegible] for the corporation.—Borough Surveyor, Town Hall.

LEATHERHEAD.—January 30th.—For the supply of about 400 barrels of refined tar, for the urban district council.—Mr. Sidney R. Drake, surveyor, Council Offices, Leatherhead.

MIDDLESBROUGH.—January 30th.—For the supply of broken and unbroken whinstone, limestone, and tarred slag and whinstone, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

OTLEY.—January 31st.—For the supply of setts, kerbs and flags, granite macadam, pitch and tar, slag dust, tar-macadam, limestone macadam, and brushes, for the urban district council.—Mr. O. Holmes, surveyor.

NESTON.—January 31st.—For the supply of broken stone, chippings, and tarred macadam, for the urban district council.—The surveyor, Town Hall, Neston, Cheshire.

NORTHANTS.—January 31st.—For the supply of broken granite, tar-macadam and slag, for the county council.—Mr. C. S. Morris, county surveyor, County Hall, Northampton.

STOKESLEY.—February 1st.—For the supply of broken and unbroken whinstone, tarred limestone, and tarred slag and whinstone, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

CANTERBURY.—February 1st.—For the supply of broken granite, granite chippings, granite dust, granite channelling, granite kerbing, and stoneware sewer pipes, for the corporation.—Mr. A. C. Turley, city surveyor, Municipal Offices.

HERTS.—February 1st.—For the supply of refined tar (to comply with the terms of the Road Board Specification, No. 1), for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

WESTBOURNE.—February 1st.—For the supply of hand-picked field stones and Portfield gravel, for the rural district council.—Mr. H. Norris, surveyor, West Ashling, Chichester.

HORNCASTLE.—February 3rd.—For the supply of about 4,643 tons of granite and about 1,807 tons of slag, for the rural district council.—Mr. J. E. Chatterton, clerk, Council Offices, Horncastle.

BEDWAS AND MACHEN.—February 3rd.—For the execution of road improvements and the construction of about 100 lin. yds. of concrete culvert, for the urban district council.—Mr. A. S. V. Taylor, Council Offices, Bedwas, Mon.

BATH.—February 3rd—7th.—For the supply of black rock, granite, flint, or other approved road stone, black rock gravel, Portland cement, fine and coarse sea sand, and lubricating oils, for the corporation.—City Surveyor.

EAST RIDING.—February 5th.—For the supply of about 8,000 tons of stone for macadamising the main roads, for the county council.—The County Surveyor, Beverley.

LITTLE HULTON.—February 5th.—For the supply of broken granite, 4 by 5 granite setts, tar-macadam, granite, limestone and slag chippings, grit, kerbs, stoneware pipes and gullies, and steam road rolling, for the urban district council.—Mr. J. H. Heyes, clerk, Council Offices, Little Hulton, Bolton.

SUNBURY-ON-THAMES.—February 5th.—For the supply of about 10,000 gallons of refined tar, for the urban district council.—Mr. H. F. Coales, surveyor, Council Offices.

SUTTON-IN-ASHFIELD.—February 5th.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burn, surveyor.

RUGBY.—February 5th.—For supplying horses and carts for road repairs, watering streets, and scavenging, for the urban district council.—Mr. J. H. Sharpe, surveyor, Benn Buildings, Rugby.

RENFREW.—February 5th.—For the supply of metal, borders, setts, and chippings, for the Upper District Committee.—Mr. R. Drummond, road surveyor, Fairfield, Paisley.

HIPPERHOLME.—February 6th.—For the supply of 2½-in. granite macadam, for the urban district council.—Mr. G. Wharton Thompson, engineer and surveyor, Council Offices, Hipperholme.

SWANSEA.—February 6th.—For the supply of about 12,000 or 15,000 gallons of best quality distilled tar, for the rural district council.—Mr. Edward Harris, clerk, Council Offices, Alexandra-road, Swansea.

MIDDLESEX.—February 7th.—For the cartage of about 7,500 tons of broken stone, 2,000 tons of chippings, about 4,000 tons of gravel, hoggin, and shingle, horsing slop carts, water vans, tarring machines, rotary brooms and scrapers, and the hire of horse, cart and van per day, for the county council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster, S.W.

STOCKPORT.—February 7th.—For the supply of manual and team labour for paving and repairing carriageways, manual and team labour for mason's work on footpaths, and team labour for carting other materials, for the corporation.—Mr. John Atkinson, borough surveyor, Borough Surveyor's Office, Town Hall, Stockport.

TRING.—February 7th.—For the supply of blast-furnace slag, granite chippings, refined tar, flints, and hoggin, for the urban district council. — Mr. S. S. Gettings, surveyor, Surveyor's Office, Tring.

MIDDLESEX.—February 7th.—For the supply of about 7,500 tons of 2-in. and 1½-in. hand-broken basalt, and 500 tons of ⅜-in. clean chippings, for the county council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster.

LITTLEHAMPTON.—February 7th.—For the supply of distilled tar, for the urban district council.—Mr. W. A. Clegg, engineer and surveyor.

EASINGWOLD.—February 7th.—For the supply of whinstone and slag, for the rural district council.—Mr. F. J. H. Robinson, clerk.

BEXHILL.—February 9th.—For the supply of distilled tar, Tarvia, or other compounds for use in tar-spraying, for the corporation.—Mr. T. E Rogers, town clerk, Town Hall, Bexhill.

UXBRIDGE.—February 9th.—For the supply of granite, tarred granite and slag, gravel, flints and hoggin, and haulage, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor, Corn Exchange, Uxbridge.

CAISTOR.—February 9th.—For the supply of about 5,000 tons of granite, about 5,400 tons of slag, about 550 tons of slag chips, and 200 tons of tar-macadam, for the rural district council.—Mr. A. A. Padley, clerk, Council Offices, Caistor, Lincs.

HEADINGTON.—February 10th.—For the supply of the best selected granite, broken and unbroken, and unscreened ½-in. granite chippings, for the rural district council.—Mr. A. Walker, district surveyor, Windmill-road, New Headington.

BRIDGWATER.—February 10th.—For the supply of stone and Tarmac, for the rural district council.—Mr. W. H. Cousins, surveyor, Union Workhouse, Bridgwater.

HERTS.—February 10th. — For surface tarring approximately 1,250,000 sq. yds. of main roads with refined tar, for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

CORNWALL.—February 10th.—For the hire of steam rollers, not exceeding ten, for a period of one year, for the county council.—Mr. L. D. Thompson, county surveyor, County Hall, Truro.

HERTS.—February 12th. — For the hire of steam and petrol rollers, for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

WALTHAM ABBEY.—February 12th.—For tar-spraying about 75,000 sq. yds. of roads, for the urban district council.—Mr. W. C. Holloway, engineer and surveyor, Town Hall, Waltham Abbey.

NORTHUMBERLAND.—February 12th.—For supplying, breaking and carting stone, for the county council.—County Surveyor, Moothall, Newcastle-on-Tyne.

LONG SUTTON.—February 13th.—For the supply of granite, slag, and granite chippings, for the urban district council.—Mr. S. S. Mossop, clerk, Long Sutton, Lincs.

NEWMARKET.—February 15th.—For the supply of about 1,000 tons of the best broken Leicestershire granite, 1½-in., 2-in., and 2½-in. gauge, 200 tons of best broken slag, 2½-in. gauge, 500 tons of granite or slag chippings, free from dust, ⅜-in. gauge, and 250 tons of ⅜-in. tarviated granite chippings, for the urban district council.—Mr. W. H. Eley, engineer and surveyor, Town Hall, Newmarket.

WETHERBY.—February 15th.—For the supply of refined tar in accordance with the Road Board specifications, for the rural district council.—Mr. E. H. Coates, clerk, Rural Council Offices, Wetherby, Yorks.

BOLSOVER.—February 21st.—For the supply of granite, limestone, slag, basalt, tarred limestone, tarred slag, refined tar, pitch, kerb, channel, sand, and stoneware pipes, for the urban district council.—Mr. J. F. Wardle, town surveyor, Council Offices, Bolsover, near Chesterfield.

MARPLE.—February 23rd.—For the supply of granite macadam and chippings, Macclesfield macadam and chippings, 6-in. grit stone setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

COCKENZIE.—For supplying and laying about 170 yds. of good, second-hand causeway setts, for the burgh council.—Mr. R. Tulloch, burgh surveyor, Cockenzie, Scotland.

Sanitary.

HAMBLEDON.—January 29th.—For the collection and removal of refuse, for the rural district council.—Mr. F. Smallpiece, clerk, 138 High-street, Guildford.

ISLE OF WIGHT.—January 29th.—For the removal of house and other refuse, for the rural district council.—Mr. H. E. Stratton, clerk, 30 Pyle-street, Newport, I.W.

BRADFORD.—January 31st.—For the supply of 20,000 cotton double filter press cloths, for the corporation.—Mr. F. Stevens, town clerk, Town Hall.

THIRSK.—February 3rd.—For the removal of house refuse and cleansing earth-closets, for the rural district council.—Mr. E. Watson, Ashton Cottage, Sowerby, Thirsk.

ROWLEY REGIS.—February 6th.—For emptying and removing house refuse, for the urban district council.—Mr. D. Wright, clerk, Council Offices, Old Hill, Staffs.

LEEDS.—February 13th.—For the supply of press filter-cloths at Knostrop sewage works, for the Sewerage Committee.—Sewerage Engineer, Great George-street, Leeds.

Stores.

WILLESDEN.—January 30th.—For the supply of masons' and paviors' works, artificial slab paving, tar paving, and the execution of tar-paving works, gravel, flints, burnt ballast, broken granite, lime, cement, salt-glazed ware pipes, oils and chandlery, coal and coke, barging road slop, horse provender, ironmongery and tools, timber, wood-paving works, horses and carts, and drivers, for the urban district council.—Mr. O. Claude Robson, engineer, Municipal Offices, Dyne-road, Kilburn, N.W.

OXLEY.—January 31st.—For the supply of setts, kerbs, flags, granite macadam, pitch and tar, slag dust, tar-macadam, limestone macadam, and brushes, for the urban district council.—Mr. O. Holmes, surveyor.

MIDDLESBROUGH.—February 1st.—For the supply of annealed scoriæ (broken), bricks, castings, concrete flags and kerbs, Portland cement, pitch and tar, sanitary pipes, gullies, junctions, slag (broken), coal (for domestic use only), coke, timber, whinstone and granite (broken), whinstone and granite setts and kerbs, brushes, bolts and nuts, disinfectants, electric lamps, general stores, glass, hardware, india rubber goods, iron and steel, leather belting, oils, paints and varnishes, packings, picks, shovels and shafts, polishes and cleansing materials, and ropes, for the corporation.—Mr. Preston Kitchen, town clerk, Municipal Buildings.

GILLINGHAM (Kent).—February 2nd.—For the supply of road materials, Portland cement and lime, requisites for precipitation works, sewer ironwork, bricks, oils, general stores and ironmongery, and disinfectants, for the town council.—Mr. J. L. Redfern, borough engineer and surveyor, Corporation Offices, Gillingham, Kent.

SWANSEA.—February 2nd.—For the supply of gullies, lamp pillars, lanterns, paving, kerbing, channelling and pitching, disinfectants, broken syenite, broken limestone, chippings, gravel, tar-macadam, refined tar, manhole covers, ventilating gratings, charcoal baskets, and step irons, for the corporation.—Borough Surveyor, Guildhall, Swansea.

GRIMSBY.—February 2nd.—For the supply of whinstone macadam, slag, artificial flags, Yorkshire flags, Yorkshire kerbs, granite setts, granite kerbs and channel, pitch, coal-gas tar, Buxton quicklime, blue lias lime, dog-kennel lime, Portland cement, drainage pipes, miscellaneous brushes, scavenging brushes, drysalteries, lubricating oils, oils, paints, bottles and corks, carbolised oil, disinfectant fluid, disinfectant powder, Formalin, and Formalin tablets, for the cor-

poration.—Mr. H. Gilbert Whyatt, borough engineer and surveyor, Municipal Buildings, 170 Victoria-street, Grimsby.

ACTON.—February 3rd.—For the supply of road and sanitary requirements, and hire of steam roller, for the urban district council.—Mr. W. Hodson, clerk, Council Offices, Acton, London, W.

SALISBURY.—February 9th.—For the supply of brushes, refined tar, oils, and disinfectants, for the corporation.—City Engineer and Surveyor, Endless-street, Salisbury.

STOCKPORT.—February 7th.—For the supply of Dalbeattie and Welsh granite setts, Welsh granite, broken for macadam, Lancashire lonkey and Lancashire grit setts, flags, kerbs, granite concrete flags, Portland cement, earthenware and stoneware pipes, iron castings, pitch, creosote oil, limestone chippings and lime, for the corporation.—Mr. John Atkinson, borough surveyor, Borough Surveyor's Office, Town Hall, Stockport.

IRLAM.—February 9th.—For the supply of broken granite, tarred slag, kerbs, setts, stoneware pipes and gullies, cement, hire of steam roller, pitch and creosote oil, disinfectants, scavenging brooms, iron castings, and team labour, for the urban district council.—Mr. R. H. Winterbottom, surveyor, Council Offices, Irlam, Lancs.

HALIFAX.—February 12th.—For the supply of materials for the tramways department, for the corporation.—Tramways Engineer, Tramways Offices, Skircoat-road, Halifax.

CHELTENHAM.—February 14th.—For the supply of sacking, castings, disinfectants, electric light fittings, forage, household goods and sundries, ironmongery, indiarubber goods, lime, bricks and sand, lead pipe, sheet lead and block tin, oils, colours, Portland cement, stoneware pipes, tools, timber, wrought iron, steel and files, for the corporation.—Mr. J. S. Pickering, borough engineer, Municipal Buildings, Cheltenham.

Miscellaneous.

BANBRIDGE.—February 3rd.—For the public lighting of the urban district with gas or electricity, for the urban district council.—The Surveyor, Municipal Offices, Banbridge.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

HAYES.—For sewering, levelling, kerbing, paving, channelling and making good part of a street, for the urban district council.—Mr. Fred W. Pearce, surveyor:—

J. Bird, Willesden Junction, N.W.	£1,396
F. Adams, Wood Green, N.	1,315
G. Wimpey & Co., Hammersmith, W.	1,040

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY

1. Institution of Civil Engineers of Ireland: Mr. F. C. Dixon on "Recent Practice in the Purification and Softening of Public Water Supplies" 8 p.m.
2. Town Planning Institute: Prof. S. D. Adshead on "Monumental Memorials and Town Planning" 6 p.m.

TENDERS WANTED.

SWANSEA RURAL DISTRICT COUNCIL.
TO CONTRACTORS AND OTHERS

The above Council invite Tenders for the Supply of about 12,000 to 15,000 gallons of Best Quality Distilled Tar, suitable for Tar-spraying Roads.

The Tar must be supplied in barrels, and be delivered free where required at different Railway Stations in the Council's District, in such quantities as may be ordered from time to time.

Tenders endorsed "Tenders for Distilled Tar," to be sent in to the undersigned on or before Tuesday, the 6th February, 1917.

EDWARD HARRIS,
Clerk.

Rural District Council Offices,
Vetch House,
Swansea.
January 24, 1917. (3,267)

HIPPERHOLME UBBAN DISTRICT COUNCIL.
ROAD MACADAM.

The above Council invite Tenders for 2½-in. Granite Macadam.

Particulars, with Specification and Form of Tender, may be obtained at once from the Surveyor.

Tenders must be sent in not later than first post 6th February, addressed to undersigned.

The lowest or any Tender will not necessarily be accepted.

G. WHARTON THOMPSON,
Engineer and Surveyor.

Council Offices,
Hipperholme.
January 25, 1917. (3,266)

LEATHERHEAD URBAN DISTRICT COUNCIL.

The Council invite Tenders for about 400 barrels of Refined Tar for Road Tar-spraying.

The Tar to be delivered free on Rail at Leatherhead Station, and no charge on empty barrels, which will be returned at the Contractor's expense.

Also about 350 tons of Fine Grouting, suitable for covering the Tar, delivered at the Leatherhead Station.

Sealed Tenders to be delivered to the undersigned by 4 p.m. on Tuesday, 30th inst., endorsed "Tenders for ——."

The Council do not bind themselves to accept the lowest or any Tender.

SIDNEY R. DRAKE,
Surveyor.

Council Offices,
Leatherhead.
January 24, 1917. (3,265)

(Continued on p. xx.)

APPOINTMENTS OPEN.

GOSPORT AND ALVERSTOKE URBAN DISTRICT COUNCIL.

The above Council invite applications for the appointment of Engineering Fitter at their Sewage Air-compressing Station.

Applicants must be ineligible for military service.

Wages, £2 7s. 6d. per week.

List of duties and Form of Application may be obtained on application to Mr. H. Frost, Surveyor to the Council, Gosport.

Applications, accompanied by copies of two testimonials of recent date, must be sent to the undersigned not later than 12 o'clock noon on Thursday, the 8th proximo, endorsed "Engineering Fitter."

(By order)
H. R. MANGNALL,
Clerk.

Council Offices,
Gosport.
January 18, 1917. (3,257)

MERTON AND MORDEN URBAN DISTRICT COUNCIL.
TEMPORARY ROADS FOREMAN.

The above Council invites applications from persons ineligible for service in H.M. Forces for the Temporary Appointment of Roads Foreman.

Applicants must be fully qualified to superintend Works of Road Making, Paving and Sewering, have had previous experience of a Road Foreman's duties under a Local Authority, and must be cyclists.

Wages, £2 10s. and 5s. War Bonus (£2 15s.) per week.

Applications, stating age and experience, with copies of two recent testimonials, to be sent to the undersigned not later than the 5th of February, 1917, endorsed "Temporary Road Foreman."

(Signed) G. JERRAM,
Engineer and Surveyor.

Council Offices,
Kingston-road,
Merton, Surrey.
January 24, 1917. (3,262)

WANTED in the office of a Municipal Engineer in the North-West of London, a Temporary Clerical Assistant, who must be ineligible for military service. He must be competent shorthand typist, and it is desirable that the applicant should be versed in the routine work of a Municipal Engineer's Office. Salary, £3 3s. per week. Applications, with copies of testimonials only, to be sent to Box 1,602, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (3,264)

The Surveyor

And Municipal and County Engineer.

Vol. LI. FEBRUARY 2, 1917. No. 1,307.

Minutes of Proceedings.

Extraordinary Traffic: Time for Proceedings.

Among the many difficult questions connected with the subject of extraordinary traffic is that of the limitation of time within which proceedings for recovery of expenses must be commenced. Sec. 12 of the Locomotives Act, 1898, provides that the proceedings shall be commenced within twelve months of the time at which the damage has been done, or where the damage is the consequence of "any particular building contract, or work extending over a long period" not later than six months after the completion of the contract or work. The latter part of the section was no doubt intended, in cases to which it is applicable, to relieve the highway authority from the necessity of having to bring several actions for damage done by traffic conducted in connection with a single undertaking. But, unfortunately, there have been wide differences of opinion as to its application, with the result that it has probably caused quite as much litigation as it has saved. And, again unfortunately, the courts have, in some instances, shown a tendency to interpret it in a somewhat restricted sense. For instance, it has been held that the haulage of timber purchased under a series of contracts from the owners of an estate is not a "work" within the meaning of the section (*Norfolk County Council* v. *Green*, 68 J.P., 223). And where the traffic consisted of the haulage of stone under a contract to deliver such quantities as the purchasers should direct during a certain year, it was held that this was not "a particular building contract or work extending over a long period" (*Bromley Rural District Council* v. *Croydon Corporation*, 1908; 1 K.B., 353). Moreover, the question is sometimes complicated by the existence of subsidiary contracts. Thus in *Epsom Urban District Council* v. *London County Council* (1900, 2 K.B., 751) the county council entered into a contract with a firm of builders to make alterations and additions to a building, with a view to adapting it for use as a lunatic asylum, and subsequently contracted with another firm for the erection of temporary buildings for use pending the completion of the alterations. Extraordinary traffic took place in carrying out both contracts, and proceedings were commenced more than six months after the completion of the first, but within six months from the completion of the second contract, and it was held that the plaintiff council could only succeed in respect of damage caused in carrying out the latter. And in *Kent County Council* v. *Folkestone Corporation* (1905, 1 K.B., 620) the corporation were widening a road, and employed a haulier to cart stone for the purpose of the work. Damage was done by the haulage to highways repairable by the county council between January 19 and March 24, 1903, but the road widening was not completed till September following. Proceedings were commenced in February, 1904, but it was held that the county council could only recover so much of the expenses as was attributable to damage done within the preceding twelve months, or, in other words, that the haulage was a separate and distinct "work" in itself, and could not be regarded as part of the "work" of road widening. On the other hand, however, where there was a single contract for the construction of a reservoir and the laying of pipes in connection with it, and extraordinary traffic took place in connection with the latter work, it was held that proceedings commenced more than a year after the pipes were laid, but before the completion of the reservoir itself, were in time (*Carlisle Rural District Council* v. *Carlisle Corporation*, 1909; 1 K.B., 471).

Another question which has sometimes arisen is what constitutes the "completion" of a contract or work for the purpose of the time limit. Where, for instance, an engineering contract contained the usual clause providing for maintenance during a period after structural completion, it was held that the six months began to run from the date of structural completion, and not from the expiration of the period of maintenance (*Lancaster Rural District Council* v. *Fisher*, 1907; 2 K.B., 516). On the other hand, in *Reigate Rural District Council* v. *Sutton District Water Company* (73 J.P., 301) the company had contracted to construct a watertight reservoir. It was so far completed that water was let in, but it proved not to be watertight, and the company were engaged in remedying defects for another three months, and it was held that the six months did not begin to run until the defects were made good. In the present state of the law, when damage is caused in the course of carrying out works likely to extend over a lengthy period, the highway authority would be well advised to commence proceedings within twelve months from the time the damage is caused (even at the risk of having to bring further actions for subsequent damage), and not to wait until the completion of the work. It should also be remembered that when the traffic is conducted by a public authority the Public Authorities Protection Act, 1893, will apply, whether the case is one of a particular contract or work or not, and that the proceedings must in all cases be commenced within six months after the damage has been done. This Act, however, does not apply where the damage has been caused by an independent contractor, and not by the authority's own servants.

Depreciation of Plant.

The paper on the "Principles Involved in Computing the Depreciation of Plant," which was read by Messrs. Gill and Cook at a recent meeting of the Institution of Electrical Engineers,

was not confined in its interest to the immediate audience. The authors wisely dealt with their subject in a perfectly general way, with the result that they have made every branch of the engineering profession, their debtors for a most illuminating and exhaustive dissertation upon an important and complex subject. There has perhaps hitherto been a tendency on the part of engineers to regard the matter of depreciation as being one for accountants rather than themselves. It is easy to show, however, that the question is one which directly affects the engineer as such. For example, in considering extensions of plant, or the adoption of improved plant, it frequently happens that the question arises whether it is economical to take out certain plant which still satisfactorily performs its allotted function and replace it by new and more up-to-date machinery. In deciding this question it is evident that more is involved than mere accountancy or finance; indeed, the main point is one which the engineer must decide for himself, and in order to do so effectively he must have an independent grip of the financial aspect of the problem. Indeed, it may be said that, if engineering and financial considerations are divorced in settling such questions, disaster and waste will follow almost as a matter of course.

Another common error in regard to depreciation is to leave it out of the question entirely except in ascertaining how much of the proceeds resulting from the trading of an undertaking may legitimately be appropriated as profits. It is, however, of the greatest importance from the very beginning of an undertaking, and ought not to be left out of account even in preparing specification. As the authors of the paper point out, when preparing a specification for plant to achieve certain definite results, there is usually more than one way of arriving at the desired end, and skilful judgment in the selection from among the alternatives must be exercised. While the first cost of alternative plans is highly important, in most cases it is nothing like so important as the annual charges, and generally the decision as to which alternative to use can be made upon consideration of the annual charges alone. The duty of studying these costs in detail cannot be avoided by saying that the capital cost and annual charges must be minimum figures; frequently these are mutually contradictory. Thus, it may be advantageous to spend extra capital to obtain low annual charges in respect of one portion of the plant, and deliberately to incur high annual charges by reducing capital expenditure on another portion. Again, it sometimes happens that even the annual charges of the whole plant will not furnish the desired criterion, since they are not the same for each year, and in those cases they must, of course, be brought to some common time-base.

In order to understand the paper it is necessary to bear in mind the distinction that is made throughout between the *physical* life of the plant, or the period of satisfactory service as shortened by causes outside the owner's control, and its *economic* life, or the physical life as shortened by causes within the owner's control, such as desire for economy, improvement of service, or the taking out of plant because a greater capacity is required. Keeping this distinction in view, the authors conclude that there is only one common method for the engineer, the accountant, and the engineer, that this common method is best studied in the annual charges for plant determined in advance of construction, and that to determine the amount of the annual charges for depreciation it is necessary to estimate the first cost, residual values, and the physical and economic lives of the various classes of plant. The whole paper, which we are reproducing in our columns, is well worthy of close study by every engineer who is responsible for the management and maintenance of plant of any kind.

Ancient Monuments.

It is not a little refreshing in these days of turmoil to turn for a little while to such a subject as the care of ancient monuments, which was dealt with by Mr. C. R. Peers in a paper which he read at the last meeting of the Concrete Institute. Although at first sight the subject is one which seems to be a little remote from the more immediate objects of the institute, Mr. Peers was able to show by a number of very interesting examples that a knowledge of modern structural methods is very necessary in dealing with the restoration of ancient monuments. As chief inspector of ancient monuments and historic buildings to H.M. Office of Works, he was able to speak with special authority. The monuments under the charge of his department range from earthworks and megalithic monuments to seventeenth-century houses, and consequently a very wide range of treatment is necessary. In certain instances—notably the restoration of Roman walls—a knowledge of the properties of concrete is of peculiar value. Many of these walls, indeed, consist of a core of concrete mixed and thrown in between the facing courses and levelled up. The walls are solid throughout and of such strength that the cutting of holes 10 ft. and more in width right through the thickness of the wall from side to side has in no way weakened the masonry above. It is hardly fair, however, to assume from such a circumstance as this that all the work of former ages was necessarily superior to that of our own time. As Mr. Peers pointed out, there has been good and bad building in all ages, and in the course of Nature more of the bad buildings have perished than of the good, and in consequence the achievement of any period which has left an appreciable number of works is liable to be judged on too favourable a ground. The Romans were great engineers, and the mortar of such of their buildings as survive in Great Britain cannot be improved on and hardly equalled at the present day. But in the fifteen centuries which have passed since they left Britain all the inferior Roman buildings have perished, and even in those that are left there is certainly no uniform standard of merit.

A problem which is of immediate importance in connection with the care of ancient buildings is that of preventing the decay of stone; for, although injury to the surface does not necessarily affect the stability of the structure, it is disastrous so far as its history and appearance are concerned. Every student of building construction knows that this subject is surrounded with difficulty, and that no attempt to find a remedy has been completely successful. Mr. Peers disclosed the fact that a series of experiments, having for their object the discovery of a really effective treatment, instituted by the Commissioners of Works, has been in progress for some time at Edinburgh, but, though certain phenomena have been definitely established, it cannot be said that any general principle of treatment has as yet been laid down. The difficulty lies not so much in getting a preservative solution to sink into the stone as in preventing it being drawn out to the surface again in the process of crystallisation and evaporation. The care and restoration of ruins is certainly one of the most difficult tasks that can fall to the lot of an architect, and it is satisfactory to know that in this country the supervision of this work is in such capable hands.

* * *

The Proposal for Municipal Reserve Funds.

The question whether municipal bodies should be authorised to levy rates in excess of their present estimated requirements is being discussed as a war emergency measure with a special eye to the possibilities of the future. Needless to remark, there is a great deal to be said on both sides. The legal position barring

urban and rural authorities from raising money except for actual necessities is clearly reasonable and fair in so far as it limits expenditure to the needs of the moment, and acts as a healthy check to extravagance. But, it is argued, in many London boroughs, and in many provincial cities too, the war has disturbed the equilibrium of the years so that no comparison is possible with peace. Woolwich is quoted as an example of this process. There, it is stated, the building of houses for Government workers has enhanced the rateable value by £32,000, so that a 1d. rate produces far more than it ever did. Things will, of course, be altered radically after the war, but meanwhile it is obvious that what Woolwich is gaining many Metropolitan boroughs not similarly circumstanced are losing as the accidental result of the abnormal times. The case for London might be met by an extension of the scope of the equalisation of rates, but such a remedy may be dismissed as impracticable for the time being. The deterioration of the roads is instanced as one of the chief arguments for the relaxation of the rule for the limitation of expenditure to actual requirements, and here there is a fairly general opinion that something should be done to anticipate the inevitable demands upon the future financial resources of the local authorities. In many instances surpluses are accruing from the roads accounts by the fact that the depleted labour market makes it impossible to expend the amount levied for highway purposes, but in many more cases the levy has been reduced to a minimum, and the present neglect necessarily postulates an enormous future outlay to bring the roads back to their normal condition. The decision of the matter rests with the permanent officials of the Government, but a hope is expressed that Lord Rhondda, as a business man, will be able to deal with the problem in some more drastic fashion than is the habit of those gentlemen. Setting aside other requirements for the moment, it is incontestible that a strong case can be made out for an excess highway rate, which need not be oppressive at present, and the reserve from which would form a welcome accumulation for the discharge of future liabilities.

* * * *

Pigsties. In our last issue there appeared a letter from the pen of Mr. T. H. Negus, district surveyor to the Meriden Rural District Council, concerning the regulation—or absence of regulation—of the construction of pigsties. The matter is probably more urgent at the present moment than at any time hitherto, owing to the efforts that are being made to increase our home-grown food supply and to the consequent stimulus that has been given to the keeping of pigs. The only direct prohibition to be found in the Public Health Acts relates to the keeping of swine *in* any dwelling-house within an *urban* district. There is, in addition, the provision of sec. 91 (3) of the Act of 1875, that any animal so kept as to be a nuisance or injurious to health shall be deemed to be a nuisance liable to be dealt with summarily under the Act. What is required, however, is some power of effective control over the erection of pigsties, rather than to wait until a nuisance actually occurs before the local authority can step in and interfere. As Mr. Negus points out—and we entirely agree with him—the only effective measure would be to impose an obligation to submit plans for approval before pigsties are erected. Unless this be done, they are bound occasionally to be erected under a neighbour's bedroom window, or actually abutting on a highway on ground the configuration of which is such as will certainly result in a nuisance from an overflowing cesspool. We go further than this, however, and suggest that effective control can only be obtained by means of by-laws. The Board of Agriculture has already issued leaflets in regard to construction, one of which contains a model plan. These leaflets, however, have no legal force, and contain nothing more than suggestions which may be adopted or ignored at will. If their principal contents were embodied in a code of by-laws, we cannot help thinking that the result would be the avoidance of many nuisances of a peculiarly offensive type and a corresponding benefit to the public health.

* * *

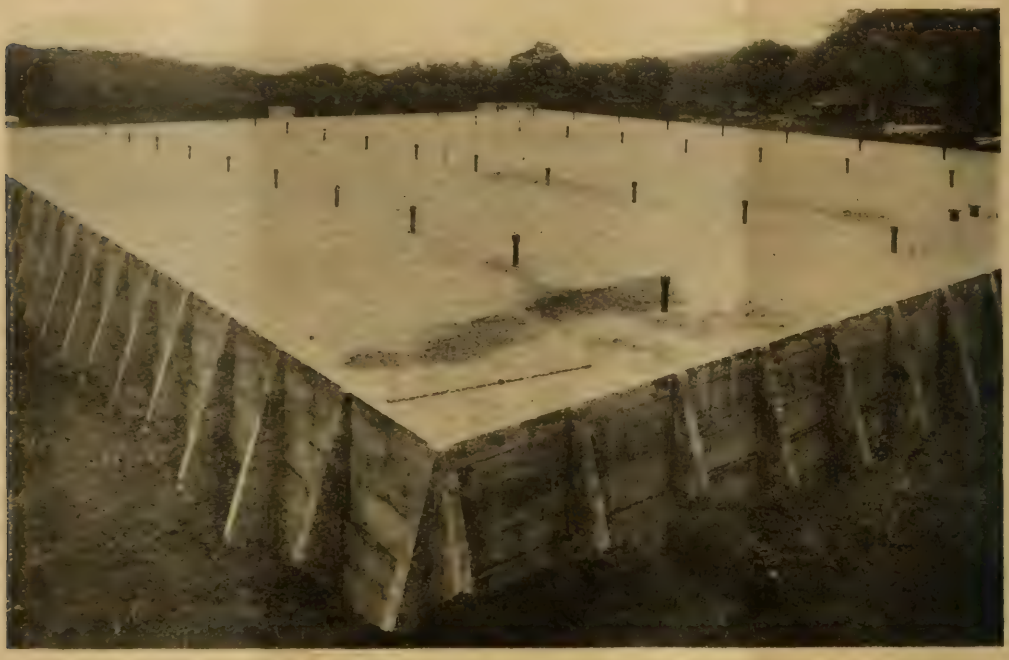
The Rights of an Inventor. The case of the *British Reinforced Concrete Engineering Company, Limited*, v. *Lind*, which was decided recently by Mr. Justice Eve, raised an interesting question as to whether an employee who is granted a patent in respect of an invention made in the course of his employment must be regarded as holding the patent in trust for his employers. The defendant was an assistant engineer in the drawing office of the plaintiff company, and his duties included the investigation of inquiries relating to reinforced-concrete constructional work, the preparation of plans, and the designing of the best method of carrying out the work. In the course of these duties he designed a form of reinforced-concrete block for lining the headings of mines, for which he subsequently obtained letters patent. In these circumstances the plaintiff company claimed a declaration that the invention was their sole property, and that the defendant held it as trustee for them. It appears from the judgment that the real question in a case of this kind is whether it is inconsistent with the good faith which ought properly to be inferred or implied as an obligation arising from the contract of service, that the servant should hold the patent otherwise than as trustee for his employer. The answer to this question must depend to some extent on the terms of the contract of service in any given case. In the particular case under discussion the learned judge thought that the terms of the defendant's employment obliged him to place the best design he could at the disposal of the company, and that it was inconsistent with this obligation that he should be allowed to retain the patent for his own benefit.

* * *

Street Architecture. The correspondence which has been going on in the columns of our contemporary the *Birmingham Daily Post* on the subject of street architecture has culminated in a definite and interesting suggestion by Mr. Herbert Buckland. This is none other than that a "Committee of Taste" should be appointed consisting of two members to be nominated by the city council, together with a number of artists and architects. The functions of the proposed committee would be strictly limited to matters directly connected with design in relation to harmony with surroundings, and it is not suggested that it should interfere in any way in the administration of building by-laws by the city council. Mr. Buckland points out that a really energetic adverse criticism of any architect's design would probably in itself cause him furiously to think, and in some cases obviate the necessity for the exercise of the powers conferred on the committee. This is by no means the first time that it has been suggested that the ordinary functions of a local authority with regard to buildings should be supplemented (or superseded) by an outside body. The present proposal, however, has this merit at least, that the proposed committee will only deal with matters of art and taste, and that the suggestion for its constitution is made without any reflection upon the work of the city council as regards the administration of by-laws. It will be interesting to observe what comments (if any) the city council have to make on Mr. Buckland's proposal.

The Stella Reservoir, Durban.

Durban is a very up-to-date town, and is noted for its splendid institutions, included among which is its water supply, which is most probably equal to that of any town of its size in the world. The climate is



THE STELLA RESERVOIR, DURBAN.

sub-tropical, and therefore a larger amount of water is consumed than in colder countries, the daily consumption averaging 6,000,000 gallons.

adequate emergency reserve connected up to the above main. It was decided that this object should be attained by the construction of a large covered-in reservoir, placed at such a level as would necessitate only a minimum amount of pumping to the higher portions of the town.

The site chosen is situated in the virgin bush, which

THE STELLA RESERVOIR IN COURSE OF ERECTION.

Owing to the increase in the size of the town it became necessary to augment the supply, and 8½ miles of 20-in. steel main were laid from the filter beds to the borough. It also became necessary to provide

is gradually being cleared away, the land being sold to supply the demands of residential requirements.

The next consideration was as to the best material with which to construct the reservoir.

Brick was considered, but it was found to work out far too expensive on account of the thick walls that would be required to withstand the pressures brought to bear against them. Not only this, but also the limited life of a brick-constructed reservoir played an important part in the abandonment of this material. On reinforced concrete being considered, it was proved to be more economical in every respect. An estimate of the cost of the reinforced concrete work was prepared, and it was decided to carry out the work by the borough engineer's department.

The foundation is good solid ant-heap, and the floor is constructed of 9-in. concrete, 9 in. thick, strengthened with reinforcement, and doubly reinforced under the columns and walls. This floor, comprising an area of approximately 3,500 sq. yds., was laid in one continuous operation by means of night-and-day shifts, anchor and bars, upon which to fix the reinforcement for walls and columns, being inserted into the floor.

The eighty columns to carry the roof were next constructed, they being 10¼ in. by 10¼ in., reinforced with four bars vertically with horizontal bindings at 10-in. centres.

The walls consist of a slab 9 in. thick at the bottom, breaking back 3 in. half way up, and carried 6 in. thick to the top. They are doubly reinforced with bars horizontally at 12-in. centres, and vertically at 20-in. centres, with buttresses at 7'6-in. centres, also reinforced both ways. The walls thus constructed were designed to withstand the whole of the earth pressures with the reservoir empty, and the water pressures when full, not taking into account the counteracting pressures from the earth filling. By this means a very substantial wall was obtained.

The roof consists of a 4-in. slab of concrete, reinforced with bars at 12-in. centres and temperature bars at 20-in. centres between the secondary beams. Inserted bars were also used over the tops of each main and secondary beam.

The main beams are placed at 15-ft. centres, and are 20 in. deep by 12 in. wide, and the secondary beams are 16 in. by 8 in. at 5-ft. centres.

This roof is designed to carry a load of 12 in. of covering soil, plus the usual allowance for accidental loads.

The internal dimensions of the reservoir are 165 ft. by 150 ft., and it is of such a depth as will allow of 13'6-in. head of water and a clearing of 3 in. under main beams. The reservoir is subdivided by means of a partition wall, and provision is made for independent service from each, thus giving every facility for cleaning purposes without in any way affecting the supply.

The capacity of each tank is approximately 1,000,000 gallons, and each is ventilated with twenty-two ventilators.

Automatic valves are used for regulating the level of the water, and recorders are fixed to each tank.

The work cost approximately £11,000, and it was undertaken when building materials were at high figures owing to the war.

As previously mentioned, the whole of the work was carried out departmentally by Mr. W. O. Roberts, the resident engineer of waterworks.

The Kahn system of reinforcement used on the work (Trussed Concrete Steel Company, Limited, Caxton House, Westminster), was supplied by Messrs. Hansford & Hansford, of Durban.

Recovery of Fats from House Refuse.—Manchester Corporation is asking all householders to keep their scraps separate from house refuse, and is collecting them and having them degreased for the purpose of obtaining fat for soap boiling and munition purposes. The residue is used for animal food.

Gas Consumption at Manchester.—The consumption of gas at Manchester, in the nine months ended December 31st last, shows a decrease of 157,399,000 cub. ft., which on being analysed shows an increase of 1·60 per cent in the day consumption (*i.e.*, 8 a.m. to 4 p.m.) and a decrease of 9·89 per cent in the night consumption, or a nett decrease of 3·69 per cent over the corresponding period of 1915. This decrease is mainly attributable to the operation of the various restricted lighting orders which have been in force during the period under review. The Summer Time Act has also affected the consumption to a considerable extent (6·53 per cent for the summer-time period).

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Now that the very representative committees of the "Safety First" Campaign Council have been formed, and have got to work, is it not to be hoped that one of the first "reforms" which will be tackled will be that of the utterly unscientific methods adopted for darkening the London streets?

* * * *

Touching street lighting, cannot some of us remember, when Euston-road was originally lighted with high central standard arc lamps of somewhat intense power, there was a general outcry among drivers that the black shadows cast at the side of and behind vehicles made driving very dangerous? Is not this always to be guarded against when arranging for street lighting, and is it sufficiently studied when arranging the position of the lamps?

* * * *

Have not some councillors the most extraordinary ideas of the duties of their surveyor? Was it not delightful to read the other day of a committee of a certain rural district council bringing up a report as to the future duties of their surveyor, in which, *inter alia*, they suggested "that on his rounds of inspection he should carry a spade with him in order that he might be able to clear any archway he found blocked to let water off the roads, or similar useful work"? Is not that touch about any "archway" too delicious, and is not the phrasing of the whole paragraph quite "too too" for words?

* *

Could we not do something in memory of that brave man and great explorer Captain Selous? Were we not struck by his brother's letter to the *Times* the other day, in which he pointed out how greatly the late Captain Selous appreciated the fact that the road in Mashonaland which he had cleared of the tsetse-fly in 1890 had been called Selous-road? Would it not be a graceful act on the part of this country if we could still further perpetuate the memory of this great man by naming some important new road after him?

* * * *

Was it not rather amusing to read in the *Nottingham Guardian* of January 10th that a local registrar of births [who had fallen foul of the Registrar-General], in sending in his resignation to the district council, finished his letter by saying, "I refuse to go to Long Bennington, and the Registrar-General can go to heaven"? Did he really mean heaven? As the council did not accept the resignation, but decided to write to the Registrar-General, would it not be interesting to know where they addressed the letter?

* * * *

Why should the Corporation of Manchester go to the expense of issuing to the scholars on the school registers 120,000 circulars appealing to citizens to clear away the snow when they refuse to engage women to assist in street cleansing? What is the reason that both the Corporations of Manchester and Salford steadfastly refuse to employ women for street cleansing when other large centres have found the employment of women for this purpose so successful? Is the Manchester mud considered to be too pronounced to give way to the efforts of the "gentler" sex?

* *

Why is it that after an external explosion the glass of the windows falls outwards into the street; and not inwards on to the floors of the buildings? Is it because the first action of the pressure of the air tends to compress the air in a room, which is immediately followed by a partial vacuum of the air outside, thus reducing the external pressure, so that the compressed air in the room breaks the windows in order to escape and regain equilibrium? If this is not the correct solution will some reader give the true scientific explanation?

*

When the question of the investment of a balance of £1,000 was under consideration, was it not rather a strange argument of a member of the Norton, Yorks, Rural District Council when he said that if they made this investment "future generations would benefit at the expense of the present ratepayers, and that the balance ought to be applied to the reduction of the rates"? Does it not seem almost incredible that such a statement could have been made, and is it surprising to read that the council unanimously voted for the sound policy of investing the money? Also that the chairman administered a dignified rebuke to the short-sighted councillor?

Principles Involved in Computing the Depreciation of Plant.*

By F. GILL and W. W. COOK, M.M.I.E.E.

It is not very satisfactory that engineers should hold such divergent views on so important a question as depreciation.

Possibly this is due to the subject being regarded as one for the accountant alone, but in our view depreciation concerns the engineer, the financier, and the accountant, and no one of the three is competent to settle the question in any particular case, as, in order to obtain correct results, there must be co-operation between the three.

While this is true in the application of the principles of it is also true that each of the three parties concerned must study the question in all its bearings, and it is just as important that the engineer should understand the financial aspect as it is for the others to follow the engineer's methods in his share of the work.

The depreciation component of cost is very often a dominating one, and it is surely illogical to leave this matter in its present unsatisfactory position while devoting time and money to investigating questions which have far less effect on the total cost.

We can discover no reason why there should not be general agreement on this question; it is so largely a question of fact, and because it is possible to demonstrate the correctness or otherwise of any system, there seems no justification for resorting to mere assertion and appeal to authority in support of any particular theory.

There is no difference of opinion as to the importance of the subject and the necessity for making some provision for depreciation. All plant has a limited life; at the end of its life it is worth nothing, except the value of the material as scrap, and it is clear that, from the moment it is first brought into use to the end of its life, a process of diminution in value is going on continuously.

Although much has been written on this subject, the only points on which all the writers are agreed are that:—

(a) The matter is one of great importance.

(b) The term "depreciation" is loosely employed, and has various meanings.

A good deal of trouble has been caused by not strictly defining the scope of the subject under discussion, and misunderstandings may be avoided in the present instance if it is made clear at the outset that by the term "depreciation" is intended to be covered: (1) Provision for the diminution in value of plant in place and working (that is, its loss in value to the owner as a continuing plant), by reason of causes *outside* his control, such as age, wear, and accidents; this provision is hereinafter called "renewals." (2) Provision to enable the owner to take plant out of commission before its physical life is exhausted in cases where, from either progress of the art or growth of the business, it is economically advisable to do so (that is, by reason of causes *within* his control); this provision is hereinafter called "improvements."

It should be noted that the expression "renewals" denotes provision in respect of actual expired capital outlay, while the expression "improvements" denotes provision to create plant to be destroyed while still workable.

Nothing is further from our minds than any setting up of standard rates of depreciation for all plant or for any section of plant. There must always be differences in conditions, and it is unlikely that any standard rates can be devised to serve all conditions.

While saying this, however, it must be made plain that the principles upon which depreciation is calculated remain the same, though the application of these principles may lead under different conditions to widely varying results.

We propose first to discuss the principles which govern the question primarily from the engineer's point of view, and it is hoped that if this be successfully accomplished it will be found to lead naturally to the financier's and the accountant's view points also.

The function of the engineer in this matter is to provide the information necessary regarding the plant, such as first cost, residual value, and life.

The function of the financier is to provide information regarding the money, the amount available, the rate at which it can be borrowed, and the rate that can be obtained for the loan of it.

The function of the accountant is to provide accurate records based on the decisions arrived at, and to see that the real results are neither disguised nor hidden.

All three must come to a common decision, and each in any calculations he has to make must work to it, otherwise nothing but chaos can result.

Generally, depreciation seems to have been regarded as almost entirely an accountant's question, to be brought into discussion only when desiring to ascertain how much of the proceeds resulting from the trading of an undertaking may be appropriated as profits. But depreciation is very important long before this stage is reached, and it is because of the great difference in opinion between engineers themselves, as well as between them and financiers and accountants, that this paper is written, in the hope that some agreement, or at any rate some clear views of the different opinions held, will emerge from the discussion.

Depreciation as Affecting the Design of Plant.

When preparing a specification for plant to achieve certain definite results, there is usually more than one way of arriving at the desired end, and skilful judgment in the selection from among the alternatives must be exercised.

While the first cost* of alternative plans is highly important, in most cases it is nothing like so important as the annual charges, and generally the decision as to which alternative to use can be made upon consideration of the annual charges alone.

One cannot escape the duty of studying these costs in detail by saying that the capital cost and annual charges must be minimum figures; frequently these are mutually contradictory.

It may be advantageous to spend extra capital to obtain low annual charges in respect of one portion of the plant, and deliberately to incur high annual charges by reducing capital expenditure on another portion.

Again, it sometimes happens that even the annual charges of the whole plant will not furnish the desired criterion, since they are not the same for each year, and in those cases they must, of course, be brought to some common time-base.

Annual Charges.

Annual charges are composed of four principal parts:—

(1) Return on capital outlay, treated as a charge, because no engineer, unless in special circumstances, is justified in putting down plant which will not pay a return on its own capital. Even in cases where a return on the outlay is not looked for, the nominal interest is a measure of the burden.

(2) Depreciation—as already defined.

(3) Maintenance, the cost of keeping the plant in as good condition as is desirable, but not of renewing it.

(4) Operation—the cost of working the plant.

The first three enter into the annual charges of all plant; the fourth does not. For example, a boiler or a tramcar requires to be operated before it can perform its function, but this does not apply to a pole.

Assume a situation in which there is as yet no plant installed and let there be two alternative ways of achieving the results required, A and B as below:—

	Alternative A. First cost, £15,000.	Alternative B. First cost, £15,000.
Annual charges—		
Return on capital	£500	£750
Depreciation	600	450
Maintenance	500	300
Operation	900	600
	£2,500	£2,100

Annual charges for A—£2,500.
Annual charges for B—£2,100.

* Paper read at meeting of the Institution of Electrical Engineers, [illegible].

* The expression "first cost" is intended to mean any or all of the following as the context requires: (a) the original construction cost; (b) the estimated original construction cost; (c) the estimated construction cost to replace the plant new.

It is evident here that, although alternative B requires more capital, it is worth while to expend the greater sum, because the annual charges are less, so that either a reduced sum can be asked for the product, or, since the results achieved are the same, the cash for the product can be the same, and an excess profit made.

At this stage it is desirable to insist upon the importance of the utmost accuracy in the preparation of the annual charges. There is still a great deal to be done in accumulating data regarding these, but so far as is possible they must be accurately founded. When it is remembered that the purpose for which they are required is to enable the engineer by their means to select plant wisely, and so to plan economically, it will be acknowledged that he must use his best endeavours to arrive at annual charges which are as correct in every possible way as he can make them.

If the cost of any plant is to be judged by its annual charges, they must be the true annual charges, and one cannot express these by the single statement that they are, say, 14 per cent per annum of first cost, unless either the cost is uniform each year, or the rate mentioned is an equated rate taken over the prospective life of the plant.

With reference to uniformity :—

Return on Capital.—The amount will be uniform if the capital has not been written down—that is, if the sums put aside for depreciation are kept in a separate fund until the sum that is required has been accumulated. If, on the other hand, part of the capital is paid off each year, the sum for return will decrease each year.

Depreciation.—Here, again, the amount required will vary according to the method of making provision and to the treatment of the capital account.

Maintenance.—For the present, let it be assumed that this is constant each year. This point will be returned to later.

Operation.—This is also taken as constant.

It is seen, then, that the sums required for return on capital and depreciation both depend upon the treatment of the capital account and the depreciation fund; in fact, these two are so intimately connected that their costs cannot be treated independently.

LIVES, PHYSICAL AND ECONOMIC.

For the purpose of this paper there are two lives which must be defined :—

(*a*) Physical life—that is, the period during which the plant would continue to perform satisfactorily the service to which it is adapted, if allowed to do so, but subject to all causes *outside* the control of the owner, such as wear and tear or accidents.

(*b*) Economic life—that is, the period of physical life shortened by causes *within* the owner's control, such as desire for economy, improvement of service, the taking out of plant because a greater capacity is required.

It is necessary to distinguish quite clearly between these two. The physical life affects the amount to be put aside each year for renewals, and, since by definition the plant can perform its service satisfactorily during the whole time, there is no compulsion to renew before the conclusion of the physical life.

The renewals fund thus ensures that the money invested in plant is always represented by the assets, provided that none of it is voluntarily destroyed.

In the conduct of a business, however, it is often desirable, in the interests of shareholders and consumers alike, to take plant out of commission before the end of its physical life, either because more economical plant is available or because it is no longer capable of meeting new developments of the business.

Since the main cause for these changes is economy, it may be argued that the cost of making them should be defrayed by new capital; but this is not always available, and if this course were adopted the new capital would not be represented by assets until the new plant had earned enough extra profit to pay for the wastage.

In order that the owner of the plant may be always in a position to take advantage of developments, and still be in a sound position, it is necessary to have a special fund available for the purpose, and such a fund is referred to in this paper as the improvements fund.

As such a fund is necessary for the successful conduct and progress of the business, the annual contributions are, in a continuing business, part of the annual charges against the plant.

The distinction between the renewals fund and the improvements fund must constantly be borne in mind.

The charges to the renewals fund represent actual expired capital outlay each year, and consequently are the measure of the diminution of the value of the plant in place considered as a structure, while the improvements fund enables plant to be superseded before its physical life is ended, and ensures that when this is done the value of the assets shall always represent the invested capital.

In a change of ownership where it is a condition that the purchaser should take over the plant as a structure, and the valuation is to be on the basis of physical life, any balance which stands to the credit of the improvements fund represents a reserve out of profits which has not been required and belongs to the seller, but if the business is purchased as a going concern, the desirability of superseding plant in the near future may be one of the factors determining the price, in which case it will be necessary to bring the improvements fund into account.

METHOD OF ARRIVING AT PROVISION FOR RENEWALS AND IMPROVEMENTS.

Looking first at renewals, what change has occurred in plant which causes it to diminish in value from 100 per cent when it is new to, say, 10 per cent at the end of its physical life?

If one takes one of the simplest possible structures, a creosoted telephone pole, and examines it, say, five years after erection, one cannot say positively that either its weight or strength is less, as there is no perceptible decay in most cases, nor can one say that it is earning less, as it will frequently be earning a larger sum per annum than at first because carrying more wires.

In fact, the only solid ground for saying its value has decreased is that it is five years nearer to the end of its life, and the question is how to find the diminution in value caused by the passage of these five years.

The methods of arriving at the deduction to be made for any plant which has already been in existence some time may be divided into two classes :—

(*a*) Based on a detailed examination of the plant and an individual assessment of values for each item.

(*b*) Based on an estimated life which the various classes of plant will have under a given standard of maintenance, and providing for the diminution in value by writing off or setting aside a proper sum in respect of each expired year (or other portion) of life.

When carefully examined there is really no sharp dividing line between these two methods.

In the case of detailed examination (*a*), proper weight can be given to condition, but physical examination alone will not enable a proper deduction to be made for the depreciated state of the plant. In some cases, for some years, the plant shows no sign of wear or decay, yet obviously some provision ought to be made for the expired life during these years.

It is usual, therefore, and necessary, to estimate the first cost, life, age, and residual value.

If individual items of plant are dealt with, the life and sometimes the age can only be judged very approximately.

If, as in method (*b*), the bulk is considered instead of the individual items, the life and age can be estimated with much greater certainty, while consideration of the amount spent on repairs and upkeep, supplemented by inspection, will give the condition.

While expert examination has a proper and most useful sphere in all cases, and is almost essential in determining the economic life, there is no means whereby one can examine plant and by that examination alone estimate what is the value remaining in the plant in place; some method of computation must be adopted.

The measurement of the effects of wear and tear and the passage of time is essentially a financial operation, and no satisfactory solution can be found without going through the steps of establishing the first cost, residual value, life, and age.

It is often said that one cannot say how long a certain plant will last; but this is not a sufficient answer. One must estimate the life if there is to be any attempt towards scientific treatment in planning.

One cannot neglect capital charges—*i.e.*, return on capital and provision for depreciation; and the latter depends very largely upon life.

Those who say the life cannot be estimated, and take, say, 10 per cent as capital charges, do, in fact, estimate the life, though they do not state the period, and they do so without taking the necessary precautions to estimate it correctly, because for any particular rate of return on money and with a given

residual value, 10 per cent per annum can only be arrived at by one definite life.

Further, without estimates of lives one cannot logically arrive at one common rate for capital charges for various classes of plant capable of living for various periods. It follows, therefore, that of necessity estimates of life must be made.

In the case under discussion, no plant has yet been constructed, so that an examination of the actual conditions is impossible in forecasting the annual charges.

Having discussed the questions of physical and economic lives, it seems advisable to turn first to the method of treating the provision for the capital portions of annual charges based on the economic life, and afterwards to the proportion chargeable to renewals and the calculation of the value of plant in place, based on the physical life.

Most of the examples in the paper which concern economic life have been worked out on a basis of :—

First cost	£100
Residual value	13 per cent
Economic life	19 years

and the examples which concern physical life on a basis of :—

First cost	£100
Residual value	2 per cent
Physical life	25 years

In both cases interest where taken is at 5 per cent per annum. The tables are merely illustrative, and the principles involved are as easily discussed on these figures as on any other, and there is some advantage to be gained by keeping the tables for economic and physical lives quite distinct in the discussion.

We suggest that it will be an advantage if those contributing other tables will, unless there are reasons to the contrary, use the same figures.

In discussing these principles the aim is to ascertain as precisely as possible the proper annual charge against each unit of plant for each year of its life, and thus each unit of plant may be considered as a person who takes service from a public utility company under the condition that he is to be charged a proper rental, which shall be exactly sufficient to safeguard the company against all proper charges and give a stated return on the capital employed.

Let the essential conditions be that the plant (or person) shall be charged with a yearly sum sufficient to :—

(1) Pay for all maintenance.

(2) Pay all operating expenses.

(3) At the end of the physical life renew the capital outlay on it.

(4) Provide sufficient money to enable the company to take advantage of improvements in the art, and take out of commission, when desirable, plant which still has some years of life left in it.

(5) Pay the company an agreed return on the money invested, say 5 per cent per annum.

(6) Let it be also assumed that the capital is £100, and that it and the plant do not increase during the whole time.

The problem then is to find how much should the plant or person contribute each year :—

(1) *Maintenance.*—For the moment this charge is assumed to remain constant, and can therefore be neglected.

(2) *Operating.*—This is assumed to remain constant, and can also be neglected.

(3) (4) *Renewals and Improvements.*—These involve the question of life and residual value. Assume the economic life is agreed at nineteen years, and that the residual value at the end of the life is 13 per cent of the first cost, after paying for cost of recovery.

(5) *Return on Capital.*—This needs no discussion.

(6) *Fixed Capital and Plant.*—This is assumed, so that a steady base may be taken throughout.

It must also be laid down what is to be done with the money received each year in advance for renewals and improvements. Everyone agrees it cannot remain idle. It cannot be invested in the business, because by hypothesis (6) the size of the plant and the amount of the capital account are fixed; it must therefore be used to repay the capital gradually or be lent at interest to someone outside the business. Assume that in the latter case it obtains the same rate as that which is agreed upon for return on capital, say 5 per cent per annum.

Since the matter can be treated in different ways it is necessary to consider what tests shall be required of the various methods. There are two: (1) The total cost of all the annual charges for the economic life of the plant shall not exceed the real cost; and (2) the incidence of the annual charges shall not be such as to cause anomalies in the conduct of the business in different years or periods, unless such incidence is due to some plant condition.

In the typical methods to be examined it is assumed that the first cost is £100, the residual value at the end of the economic life £13, and the economic life nineteen years. The total cost is therefore the return on the invested capital during the nineteen years, and £87 at the end of the nineteenth year. The simplest way to assess the whole transaction is to take the present value of all payments, and, using the assumed

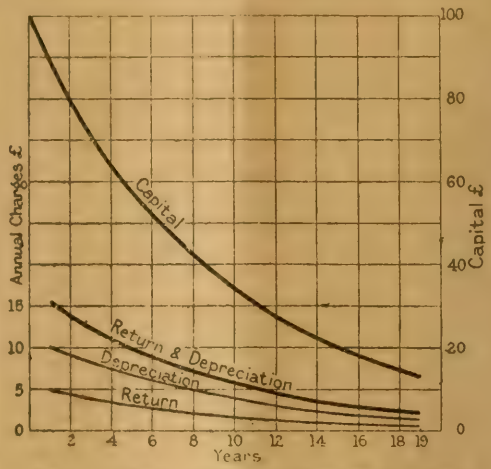


Fig. 1.—Annual Charges: Reducing Balance Method.

rate of interest—5 per cent per annum—it is found, apart from any particular method, that what is required is :—

The present value of nineteen annual payments, of £5 each, for return on capital of £100 = 5 × 12·08532	=	£60·43
The present value of £87 required nineteen years hence = 87 × 0·39573	=	34·43
		£94·86

This present value, £94·86, is then the total cost, independent of any method, to be used in the first test of any method.

There are various methods of treating the provision for depreciation, but substantially they reduce to the following :—

(1) Maintenance method, wherein no regular sum is put aside, the plant being maintained and renewed out of revenue expenditure.

(2) Reducing balance method, wherein a uniform percentage is deducted each year off the reduced capital cost.

(3) That usually called the straight-line method, wherein the annual charge is the ratio of one year to the total time or life.

(4) Sinking fund or annuity method, wherein value is given to the interest the fund will earn until it is wanted.

(1) The maintenance method affords no means of calculation; it is bound to be irregular, and, since no charge can be made until a renewal actually takes place, the method is always in arrear unless and until a complete renewal is effected.

(2) The reducing balance method is very frequently employed to ascertain the amount to be allocated for depreciation at the end of a year. The first cost being assumed at £100, the residual value 13 per cent, the economic life at nineteen years, it will be necessary to apply a rate of 10·18 per cent per annum to the reduced balance to extinguish the £87 during the life, and the costs for return and depreciation are shown in Fig. 1.

This method results in a relatively heavy charge in the early years, and a very light one in the last years. The present value of the whole series of payments is £91·86, and so this method satisfies the check as to total cost; there only remains the check on incidence.

(3) The straight line method has been strongly advocated, and requires extended consideration.

Assuming the same case as before (first cost, £100; residual value, £13; economic life, nineteen years), £87 is required in nineteen years for renewal of plant or redemption of capital.

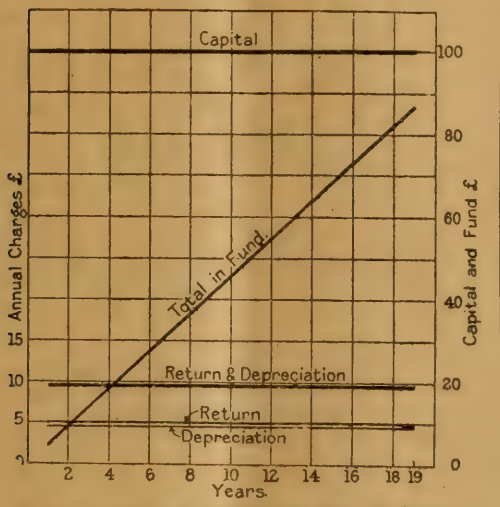


FIG. 2.—ANNUAL CHARGES: STRAIGHT-LINE METHOD AS FREQUENTLY POSED.

The straight-line method, as usually posed, is simplicity itself. Eighty-seven pounds is to be found in nineteen years; therefore, all that is required is £4·58 per annum for depreciation, and, with £5 for return, the total charges for these two heads are £9·58 per annum, as shown in Fig. 2.

This table does not, however, pass the test of total cost; the present value of nineteen annual payments of £9·58 each at 5 per cent is £115·77, instead of £94·86, an excess of £20·91.

If £4·58 be set aside annually, there will, of course, be £87 accumulated at the end of the nineteen years; but since it is not prudent to leave money idle, it is plain that interest ought to be, and will be, earned by the money so set aside annually.

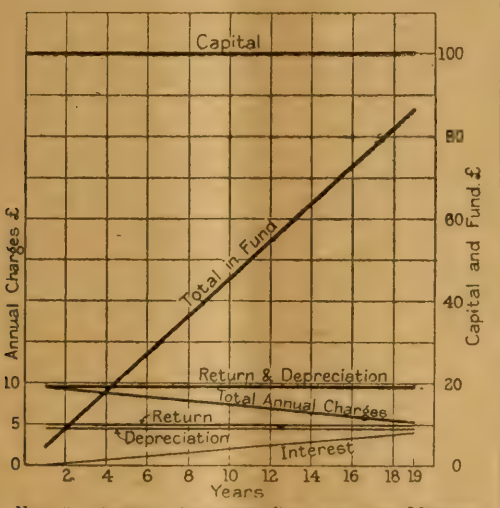


FIG. 3.—ANNUAL CHARGES: STRAIGHT-LINE METHOD IN PRACTICE.

If interest is taken at 5 per cent per annum and added to the growing fund, there will be at the end of the nineteen years not the £87 required, but £139·84, so the yearly payments must be reduced below £4·58 per annum until the amount is just sufficient to accumulate only the £87 required, and this needs a yearly payment of £2·85 for the nineteen years.

If the earned interest be not added to the fund, but credited to the general revenue account, as is generally the practice of those who uphold the straight line method, the effect is that the revenue is increased thereby, with the result that a higher return on the capital is obtained, the interest earned by the depreciation fund not being required for the plant. But this is a violation of the hypothesis, because a stated return on capital was to be earned, no more and no less.

This case is shown in Fig. 3. Here, again, the present value of all the payments exacted for the plant is too great, being £115·77.

If the straight line law is followed, but instead of accumulating a fund the capital is partly repaid each year, the present value is seen to be correct at £94·86, and there remains the question of incidence. Fig. 4 shows this.

(4) Annuity method. Fig. 5 shows the same case treated as an annuity, by which each year a part of the capital is repaid, and a return is paid on the capital outstanding.

Here the total annual charge is uniform at £7·85 per annum, made up of the decreasing return component and an increasing depreciation component. At the end of the life all the capital has been repaid, except

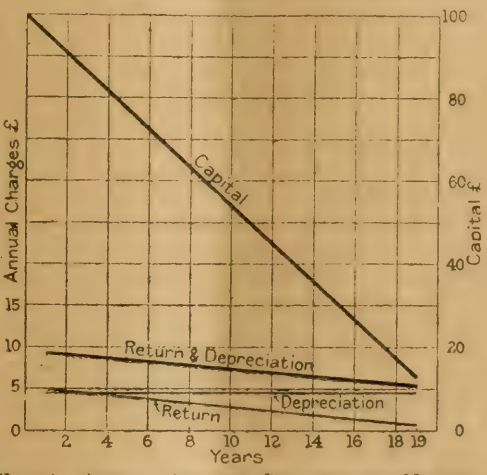


FIG. 4.—ANNUAL CHARGES: STRAIGHT-LINE METHOD. PART OF CAPITAL REPAID EACH YEAR.

£13, which will be found by the sale of the plant. The plant (or consumer) gets the benefit of interest, because as capital is repaid the return thereon ceases. The present value of the series of payments is £94·86.

(4) Sinking fund method. Fig. 6 shows the case treated by a sinking fund. In this instance the capital remains fixed at £100, and a fund is built up gradually against the end of life, at which time, and not until then, the money will be required either to repay the capital or to replace the plant.

Here the total annual charge is uniform at £7·85

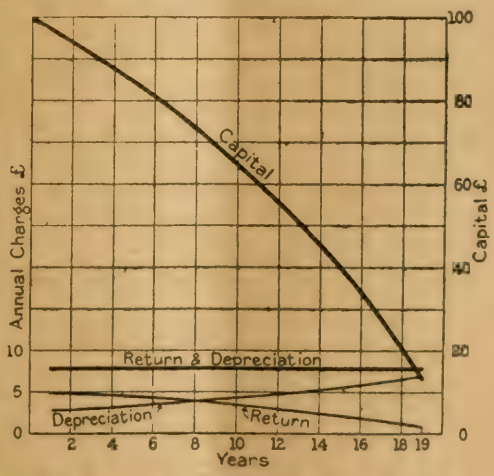


FIG. 5.—ANNUAL CHARGES: ANNUITY METHOD.

per annum, made up of uniform charges each year both for return and for depreciation. The present value of the series of payments is £94·86.

The depreciation fund is not required until the end of the life, and, of course, earns interest in the meanwhile; this interest is earned by the money contri-

levied by the plant (or person), and must somehow be credited to its source. In this instance the interest is added to the fund, and because of that addition the annual charges are reduced.

The advocates of the straight-line method have to choose between Figs. 2, 3, and 4.

They cannot adopt Fig. 2, because that requires either that no interest is earned by the money paid annually in advance, or that interest is earned but not disclosed, each being an untenable position.

They cannot adopt Fig. 3, because that requires the plant (or person) to pay an enhanced annual charge under the plea of it being required to provide for depreciation, although as a matter of fact the enhancement is used to give the owner a greater return.

They are not likely to adopt Fig. 4, because that requires a charge which reduces each year till the end of the life of each portion of plant, and then

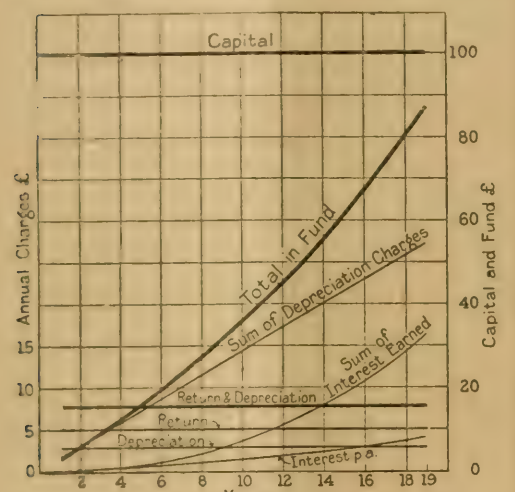


Fig. 6.—Annual Charges: Sinking Fund Method.

increases and again commences to fall. It would be impracticable to base any rates on this table.

Tabulating the present values of the whole transaction by the various methods we have Table I.

Table I.

Present value of the Annual Charges for 19 years by the various methods shown.

Method	Table No.	Figure No.	Annual charges	Present value
			£	£
Real requirements	—	—	94·86	
Reducing balance	1	1	15·18 to 2·9	94·86
Straight line as frequently posed	2	2	9·58	115·77
Straight line in practice	3	3	9·58	115·77
Straight line if proportion of capital is repaid each year	4	4	9·58 to 5·96	94·86
Annuity	5	5	7·85	94·86
Sinking fund	6	6	7·85	94·86

Now it is obvious that each method produces exactly the required present value, except that which takes up the position that interest will not be earned on the money received each year and in advance of being required, or while admitting that interest will be earned does not credit it to its source.

Examining the methods shown in 1, 4, 5, and 6, each of which has a present value of £94·86, for the test of incidence, 1 and 4 require an annual charge with varies each year, while 5 and 6 have charges which are already each year.

There is no condition as regards the plant which requires this varying annual charge, and certainly no plant condition which would enable one to distinguish between the varying annual charges in 1 and 4.

If there are some real reasons for varying annual charges, it seems they must be faced, but if they are existing it is useless to consider a forecast of annual charges with a varying scale.

The reducing balance method (No. 1) is seen to be one of convenience and not of fact, because if it were really correct that the annual charges vary in such a marked fashion—*e.g.*, first year, 15·18 per cent; sixth year, 8·87 per cent; twelfth year, 4·66 per cent—then either there must be some counterbalancing increasing cost, or the charge to a consumer for the use of the plant would require to be a reducing one.

There is no such reducing charge in practice; consequently, if the steady charge to the consumer is sufficient to give a return of 5 per cent in the first year, then the same charge will give 15·8 per cent return in the sixth year, 39·3 per cent in the twelfth year, and 94·8 per cent in the nineteenth year.

The same reasoning applies to the method shown in 4. In ordinary practice there is no such reducing charge, except in book-keeping, and that has its foundation in convenience or prudence, and not in the actual requirements of the plant.

On the other hand, both the annuity and sinking fund methods are correct in amount, satisfy all real requirements demanded by the plant, and, being uniform, can be easily handled. In practice it is not usual to repay the capital fractionally each year—the money set aside for depreciation is generally accumulated until wanted, and the sinking fund method satisfies all conditions of the problem so far.

(To be continued.)

COUNTRY ROADS BOARD OF VICTORIA.

THIRD ANNUAL REPORT.

When the Country Roads Board of Victoria, Australia—the chairman of which is Mr. W. Calder, M.Inst.C.E.—entered upon the third year of its operations, it was hoped that the work of constructing and improving the system of main and developmental roads would have proceeded uninterruptedly during the year. This hope, however, was not realised.

The difficulties experienced by contractors employing a large number of horses continued throughout the first half of the year, owing to the high cost of fodder. In addition, owing to many of the most suitable type of men for road works having enlisted for active service, contractors had great difficulty in keeping their plant fully occupied, and in expediting the completion of their contracts, with the result that many contracts were not finished until long after the specified time.

In rural districts, owing to enlistment by large numbers of countrymen, and to the fact that a record harvest was assured, there was considerable anxiety as to whether sufficient labour would be available for harvesting operations.

It also became evident that, apart from the necessity for releasing as much labour as possible for gathering the harvest, there was a considerable increase in the cost of team and manual labour required for road works, in addition to the increase caused by the war in the cost of materials, such as cement and steel, required for bridges and culverts.

Owing to these circumstances, together with the unsettled financial conditions consequent on the war, it was decided by the Government that works for which contracts had already been entered into should be completed, but that the letting of new contracts for permanent works should be discontinued by the board after October 31, 1915, until a return to normal conditions. In the meantime the roads were to be kept in a trafficable condition by means of expenditure of maintenance funds, even if an increased expenditure from this source should be found necessary.

On many of the main arterial roads of the State important works have been completed, but they consist mostly of short lengths of construction or reconstruction necessary to link up existing sections of roadway already in fairly good condition.

In the construction of lateral and developmental roads in Gippsland and other parts of the State, where such roads are of prime importance, excellent progress has been made, taking into consideration the difficulties already referred to that have had to be contended with.

In the board's first annual report special reference was made to the large number of old timber bridges and culverts throughout the State that required renewal or extensive repairs, and to the desirability of replacing or redecking these as the case requires, with more durable materials, such as reinforced concrete.

A number of photographic views in the board's third annual report—just to hand—will serve to illustrate the character of the work carried out under such

circumstances. In every instance the new structure has replaced an old timber bridge that was either completely worn out or in such a state of decay that it would not have been economical to expend further funds in repairs. Included in the appendices to the report are a set of reproductions of drawings, showing details of construction and reinforcement of a suitable type of beam bridge which has been adopted by the board for spans varying from 15 ft. to 40 ft.

MAINTENANCE WORKS.

In an appendix of the board's first annual report the distinction between works of maintenance and permanent improvements as defined by sec. 3 of the Country Roads Act was explained, and for the guidance of municipal engineers general instructions were given for the preparation of specifications for the carrying out of works of maintenance and general repairs of main roads.

In some shires where roads have been proclaimed and gazetted as main roads, the council, in anticipation of works of "permanent improvement" being undertaken at an early date, have failed to maintain certain of the main roads, and consequently they are not now in as good a condition of repair, or, to quote the words of the Act, these roads are not in the same "state of utility" as they were at the date of their declaration as main roads, although the board has provided funds for their maintenance.

As the terms for repayment by the councils of Loan Funds expended on permanent works which extend over a period of years are much easier than the terms for repayment of funds expended on road maintenance, which are a charge on the revenue of the shires during the year following the expenditure, there is a tendency in the case of some of the councils to allow their roads to get into such a state of disrepair as to necessitate their reconstruction in the near future. The board, however, intimate that this cannot be permitted. In its preliminary inspections of roads the board made careful notes of the "state of utility" that every main road was in at the time of its declaration, and if it is found that they have been permitted to deteriorate from that date through neglect of maintenance, that deterioration will require to be made good out of maintenance funds, even if the restoration necessitates extensive repairs.

Apart from this aspect of the case, however, owing to existing financial conditions, the time when works of permanent improvement may be authorised cannot be forecasted, but as it is not desirable that the condition of the roads should be allowed further to deteriorate, councils are advised to take advantage of the funds placed at their disposal by the board from year to year, and provided for out of the Country Roads Board Fund for the maintenance, repair, or renewal of the surfaces of such of the main roads within their shires as have been allowed to get into a condition of disrepair.

In the board's first annual report it was noted that the term "maintenance," as applied to a road, means the carrying out of all operations necessary to prevent it from deteriorating, and that if maintenance be delayed the road will require to be "repaired," the extent of the repairs depending upon the extent to which "maintenance" has been neglected.

The board now point out that by the judicious expenditure of maintenance funds in the repair, patching, or renewal of the surfaces of such roads as have been allowed to get into a condition of disrepair, they may be gradually brought up to such a good condition that the more expensive work of reconstruction may be postponed indefinitely. In other words, a bad road may be made a good one by a judicious system of repairs or partial renewals. "It may be," it is added, "that on certain roads the extent of the necessary repairs is such that the cost of making good the whole length of a road in one season would be beyond the financial resources of the shire, but if the work of renewal were systematically practised by taking in hand and making good a section of the road each year, its complete restoration to a good trafficable condition would be effected without unduly encroaching upon the shire's revenue in any one year."

Reinforced-concrete Tanks.—In these days when all metals are scarce and expensive the use of reinforced concrete can be substituted with advantage in the building of tanks. Several large concrete tanks have been constructed on the roof of a biscuit factory at Fulham, and, as a precaution against leakage, Pudlo has been used to waterproof the cement.

SOME RECENT PUBLICATIONS.*

THE DEVELOPMENT OF BRITISH BUILDING CONSTRUCTION. By C. F. Innocent, A.R.I.B.A. Price 10s. 6d. nett. Cambridge University Press.

Most students of mediæval architecture have in the past devoted their attention almost entirely to the stonework of the ecclesiastical buildings which still remain to us. We have all of us been brought up to regard the architecture of the Middle Ages as capable of being sorted out into its various periods. The round arch of Norman times, the pointed arch of Early English, and the flattened arch of Tudor days have absorbed most of our attention, together with the particular forms of moulding and special details applicable to each style.

Mr. Innocent has, however, written a most interesting book, which reminds us that these stone buildings, whether castle or palace, cathedral or church, although these are all that survive to us, made up but a very small part of the buildings of the Middle Ages. The larger proportion of the population, probably 90 per cent, lived in a very different class of habitation, and the dwellings of the people, whether in town or country, with their farms and their barns, were for the most part built of much less durable materials.

It is with the development of the construction of these lesser, but all-important, buildings that Mr. Innocent deals. He shows in a delightful manner how, by a process of quite natural transition, the wattle hut became the timber-framed cottage, and so on, to the labourer's cottage of more modern times.

Mr. Innocent deals in a most interesting way with the origin of the various forms of floors, slate and thatched roofs, and gives a special chapter to each. Thatched roofs are of very ancient origin, and for many a long century tiles were practically the only alternative for common use, lead being too expensive. Heavy stone slates were used in some parts of the country, but their use was largely limited by the vicinity of the quarries, although in Roman days the use of split stones for roofing purposes was widespread. The wide use of ordinary thin slates is, however, comparatively recent outside the districts in Wales and the English lakes close to the quarries, and outside these districts it will be difficult to recall many slate roofs more than a century old.

Doors and gates are next touched upon, and the chapter on windows and chimneys is full of interesting information. The use of glass in window frames of ordinary buildings is not more than 400 years old. Prior to that date the windows of a house were hung with a kind of coarse cloth, probably oiled as a protection from the weather. Open unglazed windows were common enough in country districts a century or so ago, the opening being closed with a shutter. The modern sash window dates from the latter half of the seventeenth century, but here again it did not come into general use until 150 years ago.

There is such a mass of closely packed detailed information in this book, with comparative information collated from all over Northern Europe, that one almost loses grasp of the general trend of construction in our own little island. This is a book thoroughly well worth the labour of close study, and the author is to be congratulated on the scholarly way in which he has brought together such diverse sides of his subject. Here and there, too, we get an interesting sidelight on the etymology of the terms used in everyday building. There is perhaps almost too diversified information on the subject. The examples given of each form of construction are more than sufficient to prove the author's argument, and in some cases there are too many to allow of clear continuity of thought by the general reader. It is, of course, clear that any one form of construction has in most cases many possible lines of descent from its predecessors, and one can only admire the care and scholarly enthusiasm which has made such an investigation possible.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

Belfast Ferro-Concrete Outlet Sewer.

Under the Belfast Main Drainage Act, 1887, intercepting sewers were constructed to convey the sewage of Belfast, which was previously discharged by numerous outlets into the river Lagan, to one common outfall on the Antrim side of Belfast Lough, and storage tanks were constructed to impound the sewage as the period of discharge was limited to the first 3½ hours of each ebb tide. So that the sewage should not be discharged on tidal lands, an outlet sewer 1 mile long was constructed across the foreshore to discharge into the Whitehouse Roads. The outlet sewer consisted of two tubes, each 8 ft. by 4 ft., and was constructed of timber, but it was never satisfactory, and has always been expensive to maintain.

In 1911 Parliamentary powers were obtained for carrying out various works, including a new outlet sewer of ferro-concrete to replace the original wooden structure.

In the Corporation Act of 1899 a clause was inserted providing for the purification of the sewage before discharge into the Lough, and as the sewage is now all sedimented the outlet sewer only discharges effluent and storm water. The new structure has three tubes 6 ft. 6 in. square constructed in situ; it is anchored down to timber piles to prevent flotation when the penstocks are closed and culverts pumped out for cleaning. The underside of the structure at the outlet end is 4·08 ft. below ordnance datum, and the tide levels are as follows:—

Average high-water level (spring tide), 13·1 ft. above ordnance datum.

Highest tide known, 17·76 ft. above ordnance datum.

Average low-water (spring tide), 3·69 ft. above ordnance datum.

As the shore end of the culvert is covered with water at half-tide the work had to be carried out in cofferdams, and borings which were made before the work was commenced showed that the subsoil into which the piles had to be driven consisted of from 20 ft. to 30 ft. of estuarine clay, locally known as slutch, overlying sand. To enable the work to be carried out at all states of the tide it was necessary that a gangway should be constructed above high water connecting the work with the shore, and to save the expense of temporary work it was decided to make use of the timber anchor piles for the purpose of the gangway.

The work was commenced by first partly driving the whole of the anchor piles, which were in four rows. The piles being 10 ft. apart in each row, leaving their heads well above high water. The pile driving was started at the shore end, the gangway being constructed on the tops of the piles as the pile driving proceeded, and when the whole of the piles had been thus driven and the gangway constructed, the cofferdam was commenced at the seaward end. To facilitate construction, and to enable the culvert to be cleaned out, if it ever became necessary, sets of three penstock frames were built in at distances of about 320 ft., and as the first length of cofferdam was about 400 ft., it

Belfast Ferro-Concrete Outlet Sewer. View of Cofferdam.

embraced the end of the culvert and two sets of penstock frames.

The temporary sheet piling for the cofferdam was supplied by the Ransome-verMehr Machinery Company, and had to be driven to about 20 ft. below the

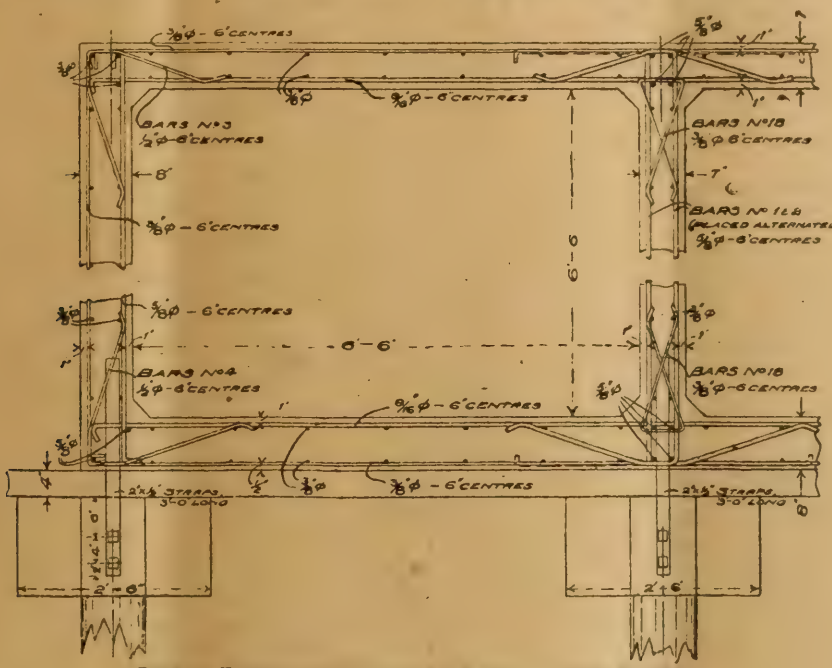
Inside of Cofferdam, Belfast Ferro-Concrete Outlet Sewer.

bottom of the excavation before the work could be satisfactorily proceeded with. When the first dam had been enclosed the anchor piles were re-driven to the depth required, the earth inside the dam excavated, and the gangway removed, the framing for the dam being put in as the excavation proceeded. After

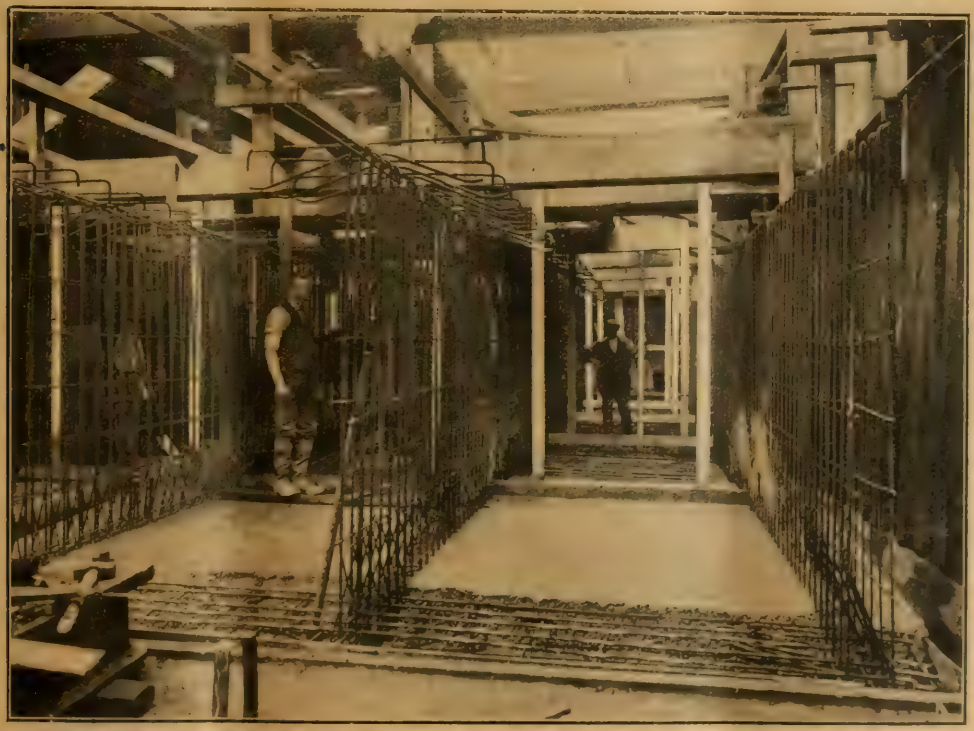
the excavation was completed the anchor piles were cut off to their proper level and iron anchors were bolted to them and surrounded with concrete.

When the cofferdam was first constructed the toes of the sheet piles were only 10 ft. below the excavated level, but as a rise and fall of the bed inside the dam of about ¼ in. occurred with each tide and caused cracks in the concrete before it had time to set, it was necessary to re-drive the sheet piles to the depth already mentioned. To avoid any cracking in the culvert, due to elasticity of the bottom, it was decided to put 12 in. of base concrete under the ferro-concrete structure, and although cracks did appear in such concrete all movement ceased when it was set, enabling the ferro-concrete work to be constructed without cracks and without the slightest difficulty.

A length of about 400 ft. of the triple culvert has been completed and tested, and the cofferdam drawn; but as, owing to the war, it has been impossible to obtain materials and labour, the work is now practically at a standstill.



Belfast Ferro-Concrete Outlet Sewer: Cross Section.



Reinforcement to Walls and Floor of Belfast Ferro-Concrete Outlet Sewer.

The work was designed by Mr. Henry A. Cutler, city surveyor, Belfast, and is being carried out by Messrs. J. & R. Thompson, Limited, contractors, Belfast, under the superintendence of Mr. F. W. Lucas, who is acting as resident engineer.

Correspondence.

Εις ἀνὴρ οὐ πάντ' ὁρᾷ.

(One man does not see everything.)—Euripides.

DECIMAL WEIGHTS, MEASURES, AND COINAGE.

To the Editor of The Surveyor.

Sir,—My attention has been drawn by an article under the above heading in your issue dated January 26th by Mr. Edward Barton, M.I.E.E., F.R.G.S. The article is almost word for word identical with the address I heard him deliver in the Council-Chamber of the London Chamber of Commerce on January 25th. I got up to reply to some of his points, but give my views at greater length here, if you will favour me with publication.

The point of view of every metric advocate is complete decimalisation. He can see nothing outside this, and any person who opposes that view, or the French metre, is hopelessly out of date and of insignificant understanding. So much has this intolerant attitude imposed upon the multitude that men who, like myself, have broader, and I think more cosmopolitan, views, are pushed aside, and run the risk of being trodden under foot by the crowd we are trying in various ways to save from a dangerous mistake.

During the address Mr. Barton mentioned that ten was the natural number, because each human being had ten fingers and ten toes. I did not refer to my own or anybody else's toes, but in my reply I claimed that I had, counting in the wrists, six attachments to each palm. I go further in this letter, and claim the human hand as a symbol of a perfect international system of weights and of measurement.

We have in each hand four fingers, together eight, and with the "feet" thrown in (a method of duplication) we can count to sixteen. This is the fractional scale, which governs most of our simple tables of weight and capacity. Adding in the thumbs, we get two "bunches of fives," or two tens if duplicated. This is the decimal scale. Taking in the wrists and ankles we get twelve and twenty-four, the duodecimal scale. As I have said before (The Surveyor, October 13, 1916, p. 330), we have mixed these three natural scales up and produced the "distracting jumble" complained of by metric advocates. I claim that all we have to do is to separate the scales, and to complete and slightly to correct them, when we shall find we possess:—

(*a*) A metric scale, as complete and perfect as the French system, but with a slightly longer metre, 39·6 in., as against 39·37 in., in fact. There is no "pandering to the gill and pint people" in the British decimal system.

(*b*) Simplified fractional scales, free from decimal and duodecimal theory, easily learnt, and most convenient to use, with vulgar fractions, and mainly with mental arithmetic, as opposed to abstruse calculations on paper.

(*c*) A duodecimal scale as perfect as the metric, and just as likely to be useful.

When I add that this system of three scales is older than ancient Babylon, that it has come down to us with an accuracy within the one-thousandth part of linear dimension that is strictly commensurate in all its branches [illegible] book, "British Trade and the Metric System"), and that its convincing truth revolutionises all previous theories of weights and measures, I can say little more. There is no object now in referring to the half-informed opinions of James Watt and other worthies. For some inscrutable purpose [illegible] was withheld from men until an absolute accident disclosed it to me while engaged in making a practical means of decimalisation of our own system on totally different lines. Never in my wildest dreams did I hope for or anticipate such a wonderful and fortunate result.

Now, sir, I ask you and all your readers and through The Surveyor, all the world, what ought humanity to do with this lucky discovery? The Decimal Association, who boast of it, have made one definite and important step through Mr. Barton.

The people before this country are only two. Adopt the French 39·37 in metre and scrap every other unit you possess, or accept that 39·6 in metric and keep all you have as well. I urge the nation to follow the latter course because:—

(*a*) With the 39·6 in metre we keep all our statistics and records. We already possess the rod, pole, or perch of 5 metres (British), the furlong of 200 metres, the square rod of 25 square metres, the rood of 1,000 square metres, and the acre of 4,000 square metres. We have a metric ton, and a metric hundredweight of 100 half-kilograms (British), each of 1·12 lb. We have a metric system already. What do we want with a modern approximative substitute?

(*b*) We adhere to a more accurate earth-measure than the French metre.

(*c*) We rouse our international jealousy, because our metre is British only in name, and native only by reason of long naturalisation.

(*d*) We retain the power of working in vulgar fractions when it suits us to do so.

(*e*) We upset nobody; we confuse nobody; we injure nobody. We do not even disturb the scientific men and electrical engineers who still desire to work in French metric units.

(*f*) We have already done much standardisation, the results of which we shall not surrender.

(*g*) The British and French decimal systems being in strict proportion in all parts, calculations made in the one are equally correct in the other, and formulæ, constants, results, &c., will be international and interchangeable, given the same general conditions and premises. You could not, of course, say that a vessel which contained 150 cubic centimetres French would also hold 150 cubic centimetres British.

(*h*) The British system, corrected and simplified, would become the most democratic of all our practical institutions. It favours as it is no class, and ignores no man, not even the meanest or most criminal and undeserving of citizens. The man who works by twos or threes, the man who works by tens, the man who wants to use eighths, sixteenths, and sixty-fourths, equally with the man who can only think clearly in decimals, are helped and served by it. We have brought our troubles on ourselves by abuse and misuse of the system to a larger extent than is generally thought.

Our currency is just as considerate and helpful. For large transactions the florin can be divided into 100 cents of account (not coined). You get the shilling of 50, the sixpence of 25, and the three-penny bit of 12½ cents. Then, because 12½ is so inconvenient a divisor, and the cent so awkward, clumsy, and frightful a small coin to employ, you divide the three-penny bit into twelve farthings, and simplify mental arithmetic and the giving of small change, to the saving of many thousands of pounds annually in labour and in time. I have always felt exceedingly sorry for the people of Ceylon. Asiatic fatalism has accepted the inevitable, and bowed to those in authority, but the act, in my opinion, is one of which any dominant race cannot be proud. Had Ceylon possessed a democratic Government the cent would have gone elsewhere.

I will conclude with one general question: Are valuable national assets, like those possessed already by the British in their existing decimal weights, measures, and coinage and fractional scales, to be scrapped like so much dirt?—Yours, &c.,

E. A. W. Phillips, M.Inst.C.E.

Hove.
January 27, 1917.

To the Editor of The Surveyor.

Sir,—It is to be hoped that Mr. Edward C. Barton's article on our weights and measures will conduce to the advancement of public opinion in favour of a change being made in our measurements and monetary methods.

I was struck by his remark that in the school life of our children there is not adequate time for the due acquisition of knowledge owing to the time being wasted by the employment of our circumlocutionary weights and measures system. This cannot be doubted, but there is another more wasteful and time absorbent procedure that is, our orthographic system—if indeed it can be characterised a system. There is method in our weights and measures, but madness prevails in the method of lettering words. Figures have one value so have measurements; five is never

The Surveyor
And Municipal and County Engineer.

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six, a yard is never a mile, a pint is never a pole; yet when a child attempts to learn to read, every letter and every combination of letters, whether vowels or consonants, comes before it with different and differing values and powers, sometimes without any value or power at all.

Take the diagraph "ea" in "hear," sounded "ee;" not so in "head," nor in "idea," nor even in "wear." On the other hand, the long "a" sound in "wear" is represented by "ey" in "they," "ai" in "vain," "a-e" in "pane," "ei" in "eight," "ay" in "say," "ao" in "gaol," "au" in "gauge," and "ah" in "dahlia." Can anything be more tantalising, time consuming, and useless?

The Simplified Spelling Society has made experiments with its alphabet, with excellent results; particulars may be obtained free on application to 44 Great Russell-street, London, W.C.

Apart from the educational help derivable from a rational system of spelling, many modifications therein could be effected by all who have to write, type, or print, by the omission of certain idle and useless letters.—Yours, &c.,

H. DRUMMOND.

Rydal Mount,
Hetton-le-Hole.
January 29, 1917.

SEWAGE PUMPING: CENTRIFUGAL PUMPS v. PNEUMATIC EJECTORS.

To the Editor of THE SURVEYOR.

SIR,—We understand that your paper publishes full "Proceedings" of the Institution of Municipal Engineers, and we note that recently a paper on "Some of the Uses of Electricity in Municipal Engineering" was read before this institution by Mr. Horace Boot.

In this discussion we note that Mr. H. C. H. Shenton said:—

"It did not seem to be generally recognised that sewage could be pumped electrically in large or small quantities by centrifugal pumps, driven by electric motors. The small pump was quite as efficient as the large one, and this method was greatly to be preferred to a long and expensive system of air-pressure mains, and a central station for compressing the air. In most towns electric power was now available, but even if it meant putting down an electric-generating plant, this would still be the better scheme."

As manufacturers of pneumatic ejectors, we should therefore like to put before you our views on this matter. Seeing that the question at issue is of great importance to municipal engineering, and that Mr. Shenton's adverse criticism on pneumatic ejectors might bias intending users, we hope you will favour us by publishing this letter in your journal.

(1) No machined surfaces or bearings are in contact with the sewage in ejectors, whereas the shaft and bearings of centrifugal pumps are always in contact.

(2) The ejector cycle is usually once per minute, the centrifugal pump cycle is usually 1,000 per minute, or more. Thus the wear and tear is great in comparison with the centrifugal pump.

(3) The high velocity of the sewage and grit past the vanes of a centrifugal does not occur in pneumatic ejectors. At no part of the ejector can high velocities of sewage create great erosion.

(4) It is not possible to work two centrifugals into one rising main without greatly reducing the efficiency of same by reason of the increased velocity of sewage, and the consequent greater head on the pumps.

A centrifugal pump to give a high efficiency must deliver a certain quantity at a certain head. If either is varied its efficiency drops rapidly. On the other hand, a pair of pneumatic ejectors, working intermittently and alternately, will work equally well into the same rising main as a single ejector.

(5) It is necesary with centrifugal pumps to have sumps, the pumps coming into work when the sump is full, and stopping when the sump is empty. This has two obvious sanitary disadvantages: (*a*) Storage of sewage is wrong, as it allows of decomposition, and gases evolved must be allowed to escape, or else the pumps may, even though submerged, refuse to work. If ejectors are used these foul gases are not allowed to escape until they reach the outfall works. (*b*) Large sumps emptying and filling leave large surfaces covered with semi-decomposed water exposed to the atmosphere, thus greatly increasing the insanitary effect of sumps. Although the ejector fills and empties in the same way, it is filled and emptied frequently; thus the sewage in the bodies of the ejectors is always fresh, and therefore not so insanitary. Secondly, the air escapes in a compressed state, so that it expands when it reaches the atmosphere, and is thus largely diluted and cannot cause so much nuisance as the air forced out of a sump as it fills. Thirdly, the sewage in the ejector is under pressure, so that there is no effervescence of the foul gases as in open sumps.

(6) No screens are required for ejectors. They will take the sundry matters that get into sewers, from intestines to bricks, which a centrifugal pump refuses to pass.

(7) Another class of objection to centrifugal pumps is their action in hot weather, not that we often get it in England, but in tropical climates this objection becomes serious. It affects the centrifugal in two ways: (*a*) The sewage is less diluted, with the consequence that the viscosity is increased considerably; the friction in rising main is thus greatly increased and requires a greater horse power in the motor. At such times the pump works very efficiently. We do not, as a rule, in England experience long periods of excessively hot weather, but they occur occasionally, and it is then, when the sewage should be dealt with most expeditiously, that the trouble begins; (*b*) the decomposition of sewage is, of course, much increased in hot weather. The sewage in a centrifugal pump is broken up to a greater extent, and even when the pump is submerged there is a slight vacuum on the intake. Thus decomposed gases are evolved, and at times even stop the work of the pump. The action is similar to that of aërated water in bottles. If under pressure with the cork in place, there is no effervescence. This is the condition of sewage in a pneumatic ejector. If the cork is removed, so that the water is under atmospheric conditions, rapid effervescence occurs. This is what happens in parts of the centrifugal pump.

(8) If centrifugal pumps have to be arranged in the streets, and below the surface, the electric motors must also be arranged below ground. Even if such chambers are tight in reference to the subsoil water, they are always damp from condensation, and liable to flooding, and it is impossible to prevent such dampness from affecting the switches and motors, however well they are enclosed. On the other hand, the motor driving the compressor for an ejector installation may be a considerable distance away from the ejector, and arranged above the ground in a dry atmosphere.

(9) With a pneumatic ejector the rising mains can be scoured by letting the full flow of compressed air on to one ejector, thus producing a very high velocity in the mains. This cannot be effected by the centri-

rugal pumps, unless the motors are of much greater power than is normally required.

(10) If an ejector is to be inspected it can be completely emptied by blowing it out, leaving not only the ejector but also the rising main empty. This is extremely handy, especially when alterations have to be carried out to the plant or to the rising mains.

(11) In small schemes the compressed air can be generated in pot-suits, and sufficient air stored to work the ejectors during the night.

(12) Electric switches are delicate things, and the repair account for them is high, compared with the cost of upkeep of ejectors. For the majority of ejector schemes one ordinary labourer can supply the necessary attention. The ejector stations are inspected about once a week. If anything goes wrong with any station the man in charge of the compressors has an instant indication pressure gauge, and by listening to the exhaust at ejector station he can detect it without going into the station. For an electric installation, if the man in charge is not an electrician, an electrician, at much higher wages than an ordinary labourer, is an absolute necessity. If anything goes wrong with an electric installation the fuses blow out and the pump stops, and there is no distinct indication that there is anything wrong; thus the stations must be visited constantly.

Ejector stations have been shut up for months together while working, and the chambers never entered, but no one would dream of this in the case of automatic electric switches.

(13) The efficiency of ejectors is not easily comparable with that of centrifugal pumps, for the efficiency of small pumps is an unknown quantity. If the pump is new, is running at the speed it was designed for, and lifting water, it may give anything from 50 to 70 per cent. If it is small and has been running for some time, the efficiency may be anything below 50 per cent.

If the horse power of the motor which is supplied for small centrifugal plants is noted it will be seen that a very low efficiency is anticipated. For instance, we have seen motors supplied by well-known makers of centrifugal pumps of larger horse powers than we would have put in for driving compressors for lifting by means of ejectors. The fact is, the efficiency of the small centrifugal pump may be 50 per cent when new, but it falls off when the pump gets worn with road grit.

Thus the efficiency of ejectors should not be compared with that of centrifugal pumps when new, but when they are half worn out, when the ejector will be found to be at least equal to the centrifugal pump, and, in most cases, higher if the air pressure is reasonable—i.e., not greater than 25 lb. per square inch.

The table below gives the efficiencies which may be expected from the Adamson pneumatic ejector plants:—

Pressure above atmosphere.	Total head of water in feet.	Efficiencies to be expected	
		Old type.	Deb efficiency type.
5	11·54	52	65
10	23·07	54	65
15	34·61	49	65
20	46·14	44	65
30	69·21	38	65
40	92·28	34	65

The above are the all-round efficiencies of water h.p. to b.h.p. exerted in driving air compressors.—Yours, &c.

DANIEL ADAMSON & CO., LIMITED.

Dukinfield.

January 29, 1917.

THE DESIGN AND COST OF RESERVOIRS.

To the Editor of THE SURVEYOR.

SIR,—I have read with great interest Mr. Baker's letter in your issue of January 19th. Mr. Baker indicates that the actual cost of the roof and pillars was about £18,000. Now I have already pointed out that the flatted crowns of the domes having a minimum cover of only 9 in. of earth are very liable to develop cracks (Mr. Binnie says minute cracks have already appeared), as the minimum thickness is only 6 in., the work is not reinforced, and in hot weather the temperature of these parts of the roof is bound to vary considerably. Therefore I think it only reasonable that before his figure is compared with mine Mr. Baker should add the cost of completing the asphalt covering of his roof. If this be done, our figures are not far apart.

It may possibly appear to Mr. Baker that my estimate has been pared down as far as possible, but this is not so. For instance, I have assumed an average wall thickness of 8 ft., whereas, the wall being half buried in the solid red sand, which about foundation-level Mr. Binnie says is practically rock, I am confident that a thickness of 6 ft. 6 in. would be entirely sufficient.

Now with regard to Mr. Baker's objections to my unit prices. As may be gathered from my first letter, I estimate for 8 to 1 concrete, so that, considering my wall concrete is much thicker than Mr. Baker's, and is straightforward work, I venture to think that my concrete figures are not far wrong. My prices of 2s. 6d. for a single ½-in. layer of asphalt on floor, and 4s. for two ⅜-in. layers on walls, are from quite recent work carried out by a very large firm, all material being analysed by experts. (While Mr. Baker is on the subject of prices it would be interesting if he would favour us with the unit prices for the pillars and roofing, as this work is unusual in this country.)

On the whole, I see no reason for revising my round figure of £69,000, but, for the sake of argument, suppose we make the following additions—viz.:—

Soiling, 50 per cent	£300
Concrete, 2s. 6d. per cubic yard ..	2,700
Asphalt on floor, 50 per cent ...	1,190
Roof drainage, 50 per cent ..	500
	£4,690

This would bring my figure to £73,690, as against Mr. Baker's £73,500. Even taking Mr. Baker's cost for my reservoir (£85,000), we are still very far indeed from Mr. Binnie's figure of £5,000 per 1,000,000 gallons (£140,000).

Now let us consider open reservoirs. Taking the figure of £73,690, and deducting the cost of the roofing (which is free to slide on the walls), roof drainage, part of soiling, &c., we get the cost of an uncovered reservoir as less than £52,000, so that roofing has added over 40 per cent to the cost of the uncovered reservoir.

Again, suppose we removed from the Cross Hill reservoir the roofing, the pillars, and the girders in the wall, &c., which have probably cost about £20,500. We would then have an open reservoir with walls averaging only 4 ft. thick. To bring these walls up to the 6 ft. 6 in. thickness previously mentioned, with 8 to 1 concrete, at, say, 27s. per cubic yard, would cost about £6,500. The cost of the open reservoir would thus be £73,500 − £20,500 + £6,500 = £59,500.

My idea of the cost is, of course, very much less than this, and, considering the nature of the foundations, I have figured out that if the lower part of the wall had been built as a slope wall (as at Frankley) the cost would have been in the neighbourhood of £1,500 per 1,000,000 gallons.

Mr. Baker, however, maintains that an open reservoir would have cost more than £2,625 per 1,000,000 gallons.

As I have ventured to put forward an estimate for an ordinary *covered* reservoir, may I now ask Mr. Baker to put forward *his* estimate of an ordinary *open* reservoir?

Half-a-dozen years ago two Westminster water engineers of long experience reported to a corporation that an open masonry reservoir (somewhat smaller than Cross Hill) would cost £1,600 per 1,000,000 gallons, the site being an average one.

Unfortunately, no drawings of the Cross Hill reservoir have been published, otherwise it is probable that not a few persons would have challenged Mr. Binnie's remarks as to reservoir costs; at least one well-known engineer of my acquaintance would have objected to the thickness of the crowns of the wall arches, considering the possible compression of the earth backing when the reservoir is full, and probably reinforced-concrete specialists would consider that the steel girders could have been replaced by steel reinforcing rods with considerable economy.—Yours, &c.,

WATER.

P.S.—I find that the figure I gave for the Honor Oak reservoir in my first letter included connections and land. The reservoir by itself cost about £3,600 per 1,000,000 gallons. (Report, Metropolitan Water Board, 1910.)

January 29, 1917.

PROFESSOR ADSHEAD AND "LOCAL SURVEYORS."

To the Editor of THE SURVEYOR.

SIR,—Professor Adshead in your issue of last week assumes a rather lofty and sarcastic kind of humour in his reply to my letter of January 12th dealing with his unwarranted and ungallant aspersions upon local authorities and their surveyors in respect of the abilities of the latter in carrying out town-planning schemes.

I still assert that the Professor's attack was groundless and unjustifiable, and this opinion I am pleased to find was supported by your able reference in the article on "Housing" in your current number.

So far as the elevating of the architectural profession is concerned, to enable them to construct roads and lay sewers possibly this may be necessary, as we "local surveyors" have had many sorry examples brought to our notice.

It is regrettable that the Professor fails to see any reason for detracting from the statement made in his lecture, as one would have thought that any person of reasonable intelligence would ere this have discovered that such statements were an insult to a body of professional men.

It is quite refreshing to read what a high opinion Mr. Adshead holds of his own profession, even if only (per his own words) for the science of "cottage building," and we surveyors will readily admit that specialising by architects in this direction is very necessary, and, further, that cottages recently erected by "local surveyors" easily outstrip from any point of view the efforts of the architect up to the present.

As to the Professor's reference to which is the better of the two professions, although I did not originally refer to this subject, I have no hesitation in claiming pride of place for our own, this being assured from our wide field of training, experience, variety of work involved, and the diplomacy necessary and employed in dealing with the other "professions."

I claim for surveyors that the right to town planning, and not that of the architect; the latter may come along later when the speculation of the builder or company commences. But having carried out the preliminary surveys, notices, enquiries, &c., made the roads and constructed the sewers, then if our authorities require we can and should complete the whole; but, while not being desirous of entirely ousting the architect, we ask for immunity from unjust attacks.

When we see so much of architects embracing surveying — "*vide* brass door plates and elaborate stationery"—the former should not "bark" at the latter if he does likewise.

I notice Professor Adshead is announced to deliver a further lecture on "Town Planning." My advice is: Stick to the architectural aspect, and evolve a good home for the artisan at rents within his means, and so prevent overcrowding, &c.

The merchant princes and villadom can look out for themselves; 'tis the community at large that requires proper housing and town planning.—Yours, &c.,

LOCAL SURVEYOR.

January 30, 1917.

AFTER-THE-WAR TRADE: OVERSEAS INDUSTRIAL EXHIBITIONS.

To the Editor of THE SURVEYOR.

SIR,—No less important than the reorganisation and speeding-up of our industrial system at home in readiness for the post-war commercial campaign is the complete remodelling and extension of our official agencies overseas.

Though there are numerous Government Committees appointed to devise ways and means for financing overseas contracts, nothing has yet been done officially to reorganise and extend our Consular system and multiply the number of His Majesty's Commissioners. We have far fewer trade commissioners than we should have, and those already engaged spend more time in compiling useless statistics than in actively extending British trade. The fault lies not so much with the men as with the system.

The Associated Chambers of Commerce have recently presented to the Government a report embodying recommendations for drastic reforms in these directions, but they do not appear to have considered the question of the establishment of permanent exhibitions of British manufactures abroad. In our judgment, any scheme of reorganisation that fails to provide these institutions in the great foreign and Colonial buying centres will lack the chief essential to success. It cannot be too strongly impressed upon the Government and the British manufacturer that the overseas buyer *wants to see the goods he is buying*. That is half the battle! For the rest, quote him figures in his own currency, at prices that include delivery at his nearest railway depot, with reasonable credit based upon the custom of the country, and no amount of competition that we are likely to meet, East or West, will seriously stand in the way of our highly organised workshops.

The Board of Trade has recently issued thousands of invitations to overseas buyers to visit the great Trades Exhibition to be held here in the spring. This is, in itself, no small tribute to the "pulling power" of the exhibition, but it is at the same time a confession of weakness. It would be infinitely better to take the exhibitions to the people overseas than to bring the people to the exhibitions.

Permanent exhibitions to which overseas buyers can go every day are vastly superior to annual displays thousands of miles away, to which not a thousandth part of the overseas buyers will ever come.

Just before Mr. Asquith's Government collapsed it was announced in the House of Commons that such exhibitions for the chief buying centres in Canada were "under consideration," but as nothing has since been heard of the proposal, it has probably followed in the wake of the Government.

We want these institutions all over the habitable globe, and if we can get them established, they will, in our judgment, do more to boost British trade and keep our machinery employed after the war than any other agency that we can put into the field.

Such a scheme, if properly organised, would be largely self-supporting. Tens of thousands of British manufacturers who find it impossible to open and staff overseas branches would readily spend a few hundreds of pounds per annum for business spaces and trade representation in exhibitions in the world's buying centres. The nearest approach to the idea that we know of is to be found in the Civic Industrial Bureau, organised by the Winnipeg Municipality, and the later developments of the Canadian manufacturers, who, we understand, are not only organising a permanent exhibition of their wares in London, but are arranging to run an exhibition train through France.

Apparently, all we want here, as elsewhere, is a Government lead, and now that the more active spirits are in power let us hope that we may get it.—Yours, &c.,

BARIMAR, LIMITED,
Scientific Welding Engineers.

C. W. BRETT,
Managing Director and General Manager.

10 Poland-street,
London, W.
January 17, 1917.

AN ORGANIZERS' CLEARING HOUSE.

To the Editor of THE SURVEYOR

SIR,—We have reason to believe that there is in the country a supply of talent and energy available for useful work which at present is either unable to find an outlet for its capacity or is misapplied.

The need for perfecting, and assisting, existing organizations is generally admitted, and there is evidence on every hand that the volume of new work to be undertaken is destined to increase.

In the stress of war the obvious need for a clearing house and intelligence department for the organizer has been overlooked. In the conviction that such a machine is useful and necessary both for workers and for those who employ them, we have opened an organizers' clearing house with the following objects:—

(1) To act as consulting organizer.

(2) To provide—and, if necessary, to superintend—organizers to assist useful work which is already being done.

(3) To provide—and, if necessary, to superintend—organizers for new work.

(4) To help "square pegs" into "square holes."

(5) To collate information about the scope and activities of existing organizations, so that those who desire to give their assistance may be guided in the right direction.

Organizers and secretaries of associations, leagues and similar societies are asked to send any information about their work and requirements, which they may

desire to be at hand for reference, to the secretary of the Organizers' Clearing House.

Those who want employment in the higher grades of organization work are invited to apply in writing to the secretary, stating their previous experience, qualifications, salary, and nature of work desired.

Suggestions from those to whom the plan of the clearing house appeals will be welcome, and should be addressed to the secretary.—Yours, &c.,

CHICHESTER.
PERCY.
F. P. WHITBREAD.
A. E. OWEN.
} Committee

PERCY CREED, Chief Organizer.

Parliament Mansions,
Victoria-street, S.W.
January 18, 1917.

RULE OF THE ROAD IN ENGLAND.

To the Editor of THE SURVEYOR.

SIR,—The question of the rule of the road in England is one which I have for some time thought is worthy of attention. Considering the large proportion of Britishers who have now become accustomed to right-hand-running traffic, through being in France and elsewhere, it will cause some confusion to these when resuming life in England. It is common experience that one very readily becomes accustomed to traffic on the right-hand of the road, but upon reverting to left-hand running one is confused for quite a long while.

After the war we look forward to considerable international movement and interchange of traffic, and if we bring our rule into line with the majority it will greatly simplify matters, not only to the drivers, but also to the manufacturers, who will be able to standardise in this respect.

Regarding the question of the 'buses and other vehicles which have been specially constructed for English rule of traffic, I would point out that their number is now lower than it is ever likely to be again, so that as new ones are required they can be built to suit the new condition.

Seeing that the people of England have so long become accustomed to abnormal traffic conditions, owing to reduced lighting and other causes incidental to the war, the immediate "after-the-war" period would be the most suitable in which to introduce a change of this nature, and before we again get into the practice of ante-war methods.—Yours, &c.,

N. D. BLAGDON PHILLIPS.

British Army in the Field.
January 29, 1917.

THE WORCESTER ACTIVATED SLUDGE EXPERIMENT.

To the Editor of THE SURVEYOR.

SIR,—I observe that in your reference to the activated sludge experiment now being conducted at Worcester, which appears in your issue of yesterday [p. 82], you state that the air delivered to the sewage is passed through pulsating valves so as to be discharged intermittently.

This is not the case. The air has been delivered continuously throughout the whole period of the experiment, which is still going on.

I thought you would like to have the statement corrected.—Yours, &c.,

THOMAS CAINK,
City Engineer.

Worcester,
January 27, 1917.

[While the passage in our special article on "Sewerage and Sewage Disposal" to which Mr. Caink draws our attention may at first sight appear open to the construction he has placed upon it, careful reading will show that the statement that "this method of treatment had then been in operation at Worcester" had no reference to the introduction of pulsating valves, but to the activated sludge process. At the same time, we freely admit that the use of the words "activated sludge process" instead of "this method of treatment" would have conveyed more clearly the meaning of the writer of the article.—Ed. SURVEYOR.]

Glasgow Tramways Free from Debt.—At a meeting of the Glasgow Tramways Committee on Wednesday it was announced that the system was now free from debt, all the capital expenditure of £3,535,156 having been repaid.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRY HELD.

West Riding Rivers Board (January 30th. Colonel T. C. Ekin).—This was an application for consent to take proceedings against four firms of chemical manufacturers who were alleged to have polluted the rivers by discharging acid into them.—Mr. Howarth, for the board, stated that the pollution complained of in these cases consisted of waste acid, and washing water containing acid of less strength, being discharged into the river. Pollution by waste acid should never be allowed to arise, and any wastage on that score was merely allowing the commission of sinful waste. Numerous and bitter complaints, extending over a long period, had been received by the Rivers Board from various manufacturers who had to use the water. The Rivers Board were loth to move, but felt that the time had arrived when it was absolutely necessary for them to apply to the Local Government Board for leave to take proceedings. Major Dent, chairman of the Rivers Board, said that during his twelve years' experience of the chairmanship the board had never had cases that gave them more trouble and required more consideration than the present cases. Dr. Wilson, inspector for the West Riding Rivers Board, said that acid in the river water would make it utterly useless for steam purposes, as the acid became concentrated in the boilers.

APPLICATIONS FOR LOANS.

Nuneaton T.C.—£19,000 for building eighty-three houses.

Willesden U.D.C.—£10,110 for the electricity undertaking.

Woolwich B.C.—£2,442 for electricity purposes.

LOANS SANCTIONED.

Hackney B.C.—£3,000 for electricity mains and switchgear.

Mansfield T.C.—£3,144 for the purchase of gas stoves for hire.

Stafford T.C.—£1,000 for electricity mains.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

SOUTH-EASTERN DISTRICT.

A general meeting of the members of the South-Eastern District will be held at the Institution Offices at 4 p.m. on Friday, February 16th.

AGENDA.

1. To read minutes of previous meetings.
2. To nominate district representative, district chairman, and hon. district secretary for the ensuing year.
3. To make arrangements for a spring meeting in Kent.
4. To consider circular from Mr. O. Claude Robson in reference to the Orphan Fund.
5. Any other business.

JOHN L. REDFERN,
Hon. District Secretary.

Richmond Bridge.—A committee of Middlesex County Council has had before it a communication from Richmond Council to the effect that the state of Richmond Bridge is totally unsuited for the traffic of the present time, and is most dangerous. The committee expresses agreement with the county engineer, Mr. H. T. Wakelam, that it is not advisable to consider the question of any expenditure on the widening of the bridge.

The Bradford Water Supply to Spenborough.—The Court of Appeal recently dismissed the appeal of the Bradford Corporation against the decision of Mr. Justice Eve dismissing with costs their motion to set aside the award of the arbitrator, Mr. G. J. Talbot, fixing the price to be paid by the Spenborough Urban District Council for water supplied by the corporation at 7d. per 1,000 gallons. The Master of the Rolls said he could not find any error on the face of the award, and he was therefore of opinion that the decision of Mr. Justice Eve was right. Lord Justice Warrington and Mr. Justice A. T. Lawrence concurred.

Law Notes.

Edited by J. B. REIGNIER CONDER, Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of The Surveyor, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. *The letter* X, *combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

Housing, Town Planning, &c., Act, 1909, and Building By-laws.—"Ynys" writes: In this urban district a wooden hut, used as a boat-house, &c., on land reclaimed from the sea, has been extended and converted into a dwelling-house, and it was occupied on or about September, 1914. This breach of the by-laws (Model Series) was reported to the Works Committee in November, 1914. Shortly afterwards the building was inspected by the medical officer of health, who recommended that proceedings should be taken in respect thereof under the Housing, Town Planning, &c., Act, 1909, with the result that a closing order under sec. 17 (2) of the said Act was served upon the owner, who was also the occupying tenant, on June 9, 1915—and the notice of closing order, which has become operative, was also served upon him on July 31, 1915. The taking of summary proceedings, as per resolution of October 19, 1915, was deferred, because it transpired that subsequent to the issuing of the closing order the occupying tenant and owner had made alterations to the dwelling-house, and after a further report from the medical officer of health, and a resolution of March 14, 1916, to take summary proceedings for an order on the tenant to quit the house, the council were advised that the delay had made the notices ineffectual. The council made another closing order in respect of the house based on another report of the medical officer of health, dated August 31, 1916, and the notice of such closing order was served upon the owner on September 18, 1916; and on serving the notice of "closing order which has become operative" upon the occupying tenant, who, as already stated, was also the owner, on November 20, 1916, it was found that the house was then being further reconstructed, mostly of wood and corrugated iron, and also being enlarged. On account of such reconstruction and extension the medical officer of health made a further inspection of the dwelling-house on December 14, 1916 (a few days before the notice of "closing order which has become operative" expired), and reported: "That it is in a state so dangerous or injurious to health as to be unfit for human habitation, but that the above condition of things is partly due to the fact that the building is in process of reconstruction and enlargement, which process is as yet to a great extent unfinished." He added that, in his opinion, the building could be rendered reasonably fit so that it would not be in a state so dangerous or injurious to health as to be unfit for human habitation, and that the shape and appearance of the dwelling-house was much improved and its cubic capacity much enlarged. The building, as reconstructed of wood, does not comply with the council's by-laws, Article 11, &c., in respect to structure of walls, &c.; but the medical officer of health suggests that the Local Government Board now countenance a different standard of houses, irrespective of stability or prevention of fire around rural parts, such as the locality in which the dwelling-house in question is situate. Having regard to his reports, already referred to, and the result of an interview which the council had with him, it is doubtful whether he would be prepared to give such evidence as would ensure an order against the occupying tenant to quit the house. Your advice as to the best procedure to be taken by the council in the matter is requested. The following alternatives are suggested: (*a*) That if after the reconstruction is completed the medical officer of health reports that the house is still unfit for human habitation, a closing order be made. (*b*) Whether the building now being reconstructed can be treated as a new building, and, if so, the owner may be summoned for not submitting plans, as required by Article 92 of the by-laws, or dealt with under Article 99, by giving him notice to show sufficient cause why such building should not be removed or pulled down—the old house was not pulled down to or below the ground floor (*vide* sec. 159 of the Public Health Act, 1875), and the occupying tenant remained there while the reconstruction was being carried out.

In the circumstances I think the better course would be to summon the owner for not submitting plans. It will then be a "question of fact" for the magistrates to decide whether the reconstruction of the house constitutes the erection of a new building within the meaning of the by-laws. If the decision is in the affirmative, the council could then proceed under by-law 99. If the decision is in the negative, and the medical officer reports that the house is still unfit for human habitation, application could be made for an order for the owner to quit.

Extraordinary Traffic.—"J. P." writes: My council are claiming under sec. 23 of the Highways and Locomotives (Amendment Act, 1878) a sum of money incurred by them as extraordinary expenses in the repair of a particular district road. The contractor, although admitting no liability, in order to save the expenses of litigation, offers a sum per ton of timber removed or to be removed over the road referred to. I presume the scale of composition is left entirely to the agreement of the parties, but can you, for my guidance, inform me of any such basis adopted in such cases, particularly the amount per ton agreed on, and whether the weight of the engine and trucks is usually included in the tonnage? You will note that the offer here is not so much per ton per mile; but perhaps you are able to inform me of a figure adopted by other councils on this basis, or otherwise refer me to such councils direct?

The amount of composition is a matter entirely for the parties to agree upon. Sec. 23 of the Highways and Locomotives Amendment Act, 1878, gives them a free hand, and enables them to deal with damage to a road either prospectively or retrospectively. I am not aware of the basis of composition usually adopted, and should think it would depend upon the particular circumstances of each case.

The Emptying of Cesspools.—"W. L. F." writes: My council, for some years past, have undertaken the emptying of certain cesspools within their area at the cost of the rates. The number of cesspools so emptied is about 75 per cent of the whole, the remainder being emptied by the owners at their own expense. The cesspools of all new houses are emptied by the council at the cost of the ratepayers. The owner of an old house having a cesspool which has hitherto been emptied by the owner now requests the urban council to undertake the emptying, and I shall be obliged if you will kindly let me know—(1) If the council must undertake this work at the cost of the ratepayers? (2) If the council can legally charge the owner or occupier the cost of this work?

(1) The council can undertake the cleansing of cesspools for the whole or part of their district, but it is doubtful whether they can restrict the undertaking to particular cesspools to the exclusion of others. See *Pegg & Jones, Limited*, v. *Derby Corporation* (73 J.P., 413). If the undertaking applies only to part of the district, and the house in question is not situate in that part, the council would not be bound to employ the cesspool; otherwise they would. (2) In my opinion the council have no power to make and enforce any such charge.

Building Line: Public Health (Buildings in Streets) Act, 1888, Sec. 3.—"Lineal" writes: A builder has submitted a plan of a house which he proposes to erect at the junction of two streets in this (urban) district, the main entrance to the house being in one (the principal) street, and the side entrance in the other (side) street. At a distance of about 60 ft. from the back wall of the proposed house there is a row of a dozen small cottages, fronting on the side street and set back 10 ft. from the street boundary. The proposed house (according to the plan) abuts upon the footway of the side street. Will you please inform me whether the council can require the house to be set back to the line of the cottages—viz., 10 ft.?

In my opinion the house is in both streets for the purposes of the Act, and the cottages are sufficiently near it to be on one side thereof within the meaning of the section, and consequently the council can require the house to be set back 10 ft. to the line of the cottages, in conformity with the Act. See *Wilson* v. *Maitland* (56 J.P., 502).

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Baildon U.D.C.—It has been decided to erect a public convenience at Panfold Hill by agreement with the Bradford Town Council as owners of the land.

St. Austell U.D.C.—The council have agreed to a scheme for the erection of an isolation hospital for twenty beds.

HOUSING AND TOWN PLANNING.

Atherton U.D.C.—Plans have been approved showing the lay-out of the site at Collier Brook Farm for the erection of working-class dwellings.

Edinburgh T.C.—With respect to the housing of Rosyth workers, the Lord Provost's sub-committee have expressed the opinion that the reconstruction of shops and offices into dwelling-houses would not meet the case. The only result of such a step would be to depreciate the value of the property so treated. So far as the overflow of people from Rosyth was concerned, it was felt that the Admiralty must first move in the matter of accommodating them before the corporation could do anything. Once the authorities made a start the city would give every assistance. A conference between the Admiralty and the city officials would be arranged as soon as possible.

Glasgow T.C.—The Special Committee on Housing and General Town Planning Improvement have agreed to the appointment of two outside architects, known to be capable of dealing with the subject of the housing of the working and poorer classes, and with general town improvement, to act in conjunction with officials of the corporation in the consideration and submission of plans of the city in connection with the proposed erection of sanitary dwellings for the working, labouring, and poorer classes, and the demolition of slums. It has also been agreed to proceed with the building of twenty or thirty tenements, in reasonable proximity to the most necessitous districts of the city, on ground either in possession of the corporation or to be acquired by them at a cheap rate.

Huddersfield T.C.—Application is being made to the Local Government Board for borrowing powers in connection with a scheme for the provision of 186 working-class houses.

Irvine T.C.—The burgh council are considering a scheme for the erection of working-class dwellings.

MOTOR TRANSPORT.

Bath T.C.—The city council have deferred the question of purchasing a new motor fire engine. Messrs. Shand, Mason & Co. wrote that they could not tender as requested owing to being on Government work, and Messrs. Dennis Brothers, Limited, were unable to tender to the specification submitted, but would quote for a vehicle fitted with a turbine pump, if so desired.

Brighton T.C.—Two motor vehicles are to be purchased for street watering and haulage.

Chipping Sodbury R.D.C.—The council will consider the purchase of a tractor at their next meeting.

Folkestone T.C.—It has been agreed to purchase a "first aid" fire motor at a cost not exceeding £250.

Sedgley U.D.C.—A steam tractor which was to have been delivered to the order of the council has been requisitioned by the Government.

Sudbury R.D.C.—The council are seeking to join with the Cavendish Urban and Rural Councils for the purchase of a motor fire engine for the use of the three districts.

ROADS AND MATERIALS.

Chislehurst U.D.C.—It was reported that the county surveyor had agreed that the county council would defray the cost of repainting the posts of the motor signs which are fixed on the paths and likely to be a source of danger to the public.

Deptford B.C.—The Works Committee are recommending the borough council to purchase a tar-spraying machine at an approximate cost of £100.

Headington R.D.C.—The surveyor, Mr. A. Walker, has submitted an estimate of £1,017 for the repair of the Cowley-Littlemore road, which has been badly damaged by motor-'bus traffic.

Lindsey C.C.—The council have approved a report of the Highways Committee recommending that the district councils from and after March 31 and until April 1, 1918, should undertake the maintenance and repair of all the main roads situate within their respective districts, except main roads now directly maintained by the councils, and also to undertake such improvement and enlargements of and other dealings with all or any of the main roads, and such new works upon the main roads as may from time to time be sanctioned by the committee, but not further or otherwise.

Manchester T.C.—The town council have received the following resolution from the Manchester and Salford Social Welfare League: "That the Social Welfare League, while understanding the difficulties of effective work during the present abnormal period, believes that much could be done to improve the condition of Manchester streets by the adoption of mechanical appliances, and by organising a new body of gleaners as suggested by the Women's Citizens' Association; and the league trusts that the Cleansing Committee will give its best consideration to the practical proposals which the Women Citizens have made."

Mansfield T.C.—The town council have intimated to the Road Board that they will be prepared to contribute a moiety of the estimated cost (£985) for the repair of Sherwood-road.

Newry U.D.C.—Tenders are being invited for 2,000 tons of broken stone for the repair of the town streets.

Newton Abbot R.D.C.—The War Office have written that they are unable to supply prisoners of war for the roads, as there is such a demand for them for other work.

Notts C.C.—A report of the Highways and Bridges Committee, presented at Tuesday's meeting of the county council, contained the following list of improvements which it is proposed to carry out after the war: Resurfacing of county main roads: Nottingham to Newhaven, $8\frac{3}{4}$ miles. Mansfield to Derby, $7\frac{3}{4}$ miles. Newark to Gainsborough, $4\frac{1}{2}$ miles, £26,250; Nottingham and Loughborough main road, improvement to Bunny Hill, £3,000; resurfacing the remaining portion of the Fosseway between Newark and Lincoln, £8,000; Nottingham to Newhaven main road, Middlebrook Hill, £1,000; Newark to Lincoln, Fosseway near Leicestershire county boundary, £6,000; new communication, Nottingham to Bawtry-road, £39,600; total, £83,850.

Omagh R.D.C.—The county surveyor, Mr. Leebody, submitted an estimate of £16,945, an excess over the limit of expenditure of £3,909. The estimate was rejected by the council, and the limit of expenditure fixed as before at £13,033. The county surveyor brought forward a proposal to work all the roads in the Fintona district by direct labour instead of by contract, and stated this was the only alternative to the council increasing the limit of expenditure. He hoped by direct labour to be able to continue the work without increased expenditure. The council, however, decided in favour of the contract system, and rejected the proposal.

Rutland C.C.—The council have directed the Oakham Urban and Rural District Councils and the Uppingham Rural District Council to undertake the maintenance of the main roads in their respective districts for another year, ending March 31, 1918, at the following sums: £130 per mile for the Oakham Urban District, and £60 per mile for the Oakham and Uppingham Rural Districts, with an additional £50 for the main roads in the parish of Uppingham.

St. Ives T.C.—The continuation of the Wharf-road improvement and the proposed construction of a slip-way is engaging the attention of the council.

Settle R.D.C.—The surveyor, Mr. W. A. Stuart, has been instructed to prepare an estimate of the cost of making up Tems-street, Giggleswick.

Uxbridge R.D.C.—The Highways Committee have been asked to consider the question of the employment of German prisoners on the roads.

SEWERAGE AND SEWAGE DISPOSAL.

Aylesbury R.D.C.—The council are asking the county council to take the necessary steps to prevent the floodings at Bierton.

Bolston U.D.C.—The surveyor, Mr. V. Turner, has submitted a proposal for the provision of screening and dredging plant at the sewage disposal works, at an estimated cost of £700. The council have referred the matter back for further consideration.

Easington R.D.C.—A letter was recently received from the Ministry of Munitions declining to grant a licence for the continuation of the Wingate sewerage scheme. Subsequently the Local Government Board were asked to advise the council as to whether the contractors had any legal claim for compensation, and they had replied that the matter was not one upon which they could undertake to advise the council. Next the clerk sent the whole of the information to the Defence of the Realm Losses Commission, and they had replied that the commission would not be prepared to regard any loss suffered in this respect as loss due to specific interference on the part of the Crown, and that they could not undertake to advise the council with regard to the legal position. In the circumstances the council have decided to meet the contractors and have the whole matter discussed.

Hayes U.D.C.—A scheme for the extension of the sewage disposal works at an estimated cost of £5,500 has been submitted to the Local Government Board for approval.

Leake R.D.C.—It was reported that the War Office were putting in a sewerage scheme of their own at the prisoners' camp at Sutton Bonnington.

WATER, GAS, AND ELECTRICITY.

Ashbourne U.D.C.—A site is to be purchased near Clifton-road for a supplemental water supply.

Bolton T.C.—Powers are to be applied for by the corporation to form impounding reservoirs in North-East Lancashire by constructing dams across the Roeburn and Hindburn rivers. Of the two reservoirs proposed on the Roeburn, one is to be formed by a dam in Roeburndale, at a point some 7 furlongs from the Mallowdale Bridge. The other, across the same stream, is to be in Mallowdale. Two reservoirs are also to be constructed on the Hindburn River, and are to be known as the Hindburn and Swans reservoirs. To facilitate the works powers are taken to lay down railways from Hornby Station on the Midland Railway to the reservoir sites, which are some 10 miles distant from Blackburn.

Burnley T.C.—The Electricity Committee are considering a scheme for supplying electricity to the Rose Grove area after the war.

Eccles T.C.—The town council are making inquiries of the Salford Corporation and the Lancashire Electric Power Company as to the terms for the supply of electrical energy in bulk.

Falkirk T.C.—A committee has been appointed to inquire into the question of the extension of the electricity works.

Fulham B.C.—It is intended to instal at the electricity works a centrifugal pump and galvanising hot well for use in connection with the economisers in the boiler house.

Honiton T.C.—It was reported that the gas company had decided to make an allowance of 20 per cent. on their account for public lighting during the past quarter.

Leigh T.C.—The town council have approved the proposal of the Electricity Committee to link up the electricity undertaking with the South Lancashire Tramways Company.

Lytham U.D.C.—Consideration is being given to the provision of two purifiers at the gasworks.

Newton Abbot R.D.C.—It was reported that the negotiations for the purchase of additional land for water supply at Bovey Tracey are proceeding satisfactorily.

Tredegar U.D.C.—The council discussed on Tuesday the Ebbw Vale Water Bill, and decided to lodge a petition in opposition to it unless a clause was inserted leaving the charges for water in the Sirhowy district on the present basis.

Uxbridge U.D.C.—The council have resolved to give notice of objection to the new powers being applied for by the Rickmansworth and Uxbridge Water Company. It was stated that under the proposed new Order the company wanted the power to open up connection pipes when they thought fit, and to charge the cost to the consumer.

Willesden U.D.C.—The council are recommended to take up a loan for the extension of the electricity mains and the provision of transformers.

MISCELLANEOUS.

Leicester T.C.—The Estates Committee reported that under the powers of the Cultivation of Lands Order they had taken possession on behalf of the council of over 80 acres of unoccupied land. Up to the present 960 persons had undertaken to work upon the land taken over.

Tynemouth T.C.—It was reported on Wednesday that the Watch Committee were considering the condition of the fire brigade, and that they were determined to have "a proper reorganisation from top to bottom."

Wellington (Salop) U.D.C.—The works proposed to be carried out during the year include a 16-in. diameter borehole, pumping station, and refuse destructor, at an estimated cost of £7,500; new sewers at Station-drive, Market-street, and Bridge-road, at an estimated cost of £7,000; and a public convenience at Station-drive.

PERSONAL.

Mr. G. Prout, surveyor to the Wiveliscombe (Somerset) Urban District Council, has resigned, owing to ill-health.

Mr. J. W. Lupton, highways surveyor to the Flaxton Rural District Council, has been voted a bonus of £10 per annum.

Mr. T. Harold Davies, surveyor to the Oswestry Rural District Council, has received a commission in the Royal Engineers for road work in France, and the council are advertising for a temporary surveyor.

Mr. W. Truscott, acting highway surveyor and assistant sanitary inspector to the Liskeard Rural District Council, has been placed on the list of applicants for a commission, and the council are advertising for a surveyor for the duration of the war.

Mr. R. Bruce Gray, surveyor to the Selby Urban District Council, has received a commission in the Roads Battalion of the Royal Engineers, and Mr. R. Penty, of Selby, has been appointed acting surveyor and sanitary inspector during his absence.

Mr. Wm. Nisbet Blair has received the congratulations of his council upon his twenty-five years' service as borough engineer and surveyor of St. Pancras.

Mr. S. A. Bennett, Assoc.M.Inst.C.E., who for some years has been deputy surveyor of Monmouthshire, is recommended by the Main Roads and Bridges Committee of the county council for the post of county surveyor in succession to the late Mr. William Tanner. The salary is £450, rising to £500 per annum.

Mr. W. Baker, chief water inspector of the Doncaster Corporation for the past five years, was recently presented by Mr. R. E. Ford, acting borough surveyor, with a double gold albert subscribed for by the officials of the department. Mr. Baker has accepted an appointment under the Sheffield Corporation water department.

Mr. A. Tillotson, borough surveyor of Honiton, has been called up for road making in France, and the town council have agreed to make up the difference between the Army allowance and his salary. Mr. W. B. Cox, jun., has been appointed in his absence to act as sanitary inspector and water bailiff, and Mr. W. B. North as inspector of the roads.

Mr. S. S. Gettings, Assoc.M.Inst.C.E., surveyor to the Tring Urban District Council, who has been appointed surveyor and sanitary inspector to the Dorking Urban District Council, began his professional career as an articled pupil to Mr. A. D. Greatorex, M.Inst.C.E., borough engineer and surveyor

of West Bromwich, after which he was appointed assistant in Mr. Greatorex's office. Subsequently he held the following appointments—viz.: 1901-1902, assistant engineer to Messrs Willcox & Raikes, civil engineers, of Birmingham; 1902-1906, chief assistant borough engineer and surveyor of West Bromwich; 1906-1907, resident engineer to the Campden District

Mr. S. S. Gettings,
Dorking's New Surveyor.

Council; 1907-1909, resident engineer to the Tring Urban District Council; and 1909 to present date, surveyor to the Tring Urban District Council. During his nineteen years of professional work he has had a varied and practical experience in road construction, and—at West Bromwich and Campden—the preparation of plans and the supervision of the construction of many public buildings and works. As resident engineer at Tring he supervised the construction of the main sewerage and connections of the west end of the town, while as surveyor and inspector of nuisances he has carried out many important road and other schemes.

OBITUARY.

Mr. Walter Wrennall, assistant water engineer to the Corporation of Cape Town, died on January 9th while on active service in German East Africa. He was four years the assistant building surveyor in the same service. Prior to going to South Africa he was engaged at Willesden, and for many years was chief assistant to his father, who has an estate business in Liverpool. During his service with the S.A. Field Artillery he proved himself an excellent officer.

Birmingham Tramways Undertaking.—At a meeting of Birmingham Tramways Committee it was stated that, owing to the recent stoppage of the tramway service, no contribution in relief of rates was possible. Last year £50,000 was available.

FOR OTHER ADVERTISEMENTS
See End of Paper.

HASLEMERE URBAN DISTRICT COUNCIL.

HASLEMERE WATERWORKS

The above Council require the services of a man, ineligible for military service, to generally assist at their Water-pumping Station.

Salary 25s. per week, with house, fire and light.

A [illegible] possess some knowledge of gas-engines.

Applications, in candidate's own writing, accompanied by copies of three recent testimonials, to be delivered to the undersigned on or before Friday, February 9th, 1917.

A. C. WHITCHER,
Clerk to the Council

[illegible]
Haslemere.
Surrey.
January 31, 1917. (3,284)

TRING URBAN DISTRICT COUNCIL.

SURVEYOR, INSPECTOR OF NUISANCES, &c.

Applications are invited for the appointment of Surveyor, Inspector of Nuisances and Canal Boats, and Inspector of Petroleum to the Council, the population of whose District is about 4,500, and the area 4,354 acres. The duties include the collection of the rents of the Council's property, consisting of 56 cottages. The person appointed will be paid an inclusive salary, commencing at £150 per annum. He will be required to reside in Tring, and to devote the whole of his time to the duties of the office.

Canvassing is prohibited, and will be considered a disqualification.

Applications, in candidate's own handwriting, marked "Surveyor," and stating age, qualifications, experience, position with regard to military service, and when able to take up duties, with copies of not more than three recent testimonials, to be received by me not later than Monday, the 12th instant.

A. W. VAISEY,
Clerk to the Council.

Tring.
February 2, 1917. (3,285)

TOTNES RURAL DISTRICT COUNCIL.

HIGHWAY SURVEYOR.

The Council require the services of a Highway Surveyor for the No. 2 District, at a salary of £130 per annum. Particulars of the terms upon which the appointment will be made may be obtained from the undersigned. Applications, in candidate's own handwriting, stating age and experience, with copies of three testimonials of recent date, to reach me not later than 9 a.m. on Wednesday, 14th February next. Jno. S. Portch, Deputy Clerk to the Council, 19 High-street, Totnes. January 27, 1917. (3,285)

BRIDGNORTH RURAL DISTRICT COUNCIL.

The above Council invite Tenders for the Supply of Granite and Slag, delivered at various Stations and Wharves in the District, for the year ending March 31st, 1918. Tenders to be sent in not later than the 22nd February to the undersigned, from whom Forms of Tender and particulars may be obtained.

F. RICHARDS,
Surveyor.

Bridgnorth.
January 31, 1917. (3,283)

COUNTY BOROUGH OF BELFAST.

WORKS DEPARTMENT.

TENDERS FOR STORES, WORK, AND UNIFORM CLOTHING.

The Works Committee are prepared to receive Tenders for the Supply of the following Stores, Work, and Uniform Clothing for the year, commencing 1st April, 1917:—

Earthenware Sewer Pipes.	Shovels, Spades, Graipes and Buckets.
Timber.	Scavenging Brushes.
Slates.	Glazed Bricks.
Hardwood.	Artificial Flags.
Iron Castings.	Lime.
Plumbers' Work.	Pitch, Felt, Tar, &c.
Nails, &c.	Sea Sand, Sea Gravel, and Lough Neah Sand.
Iron and Steel.	Cement.
Paints, Oils, &c.	Uniform Clothing and Hats.
Glazing.	
Mill Furnishings.	

Forms of Tender and particulars may be obtained from Mr. Hector F. Gullan, M.Inst.C.E., Superintendent of Works, City Hall.

Sealed Tenders, on official Forms only, endorsed "Tender for ——, Works Department," to be lodged in my Office before 12 o'clock noon on 13th February.

The lowest or any Tender will not necessarily be accepted.

The whole or any part of a Tender may be accepted.

An official receipt must be obtained for every Tender delivered by hand. Tenders sent by post must be registered.

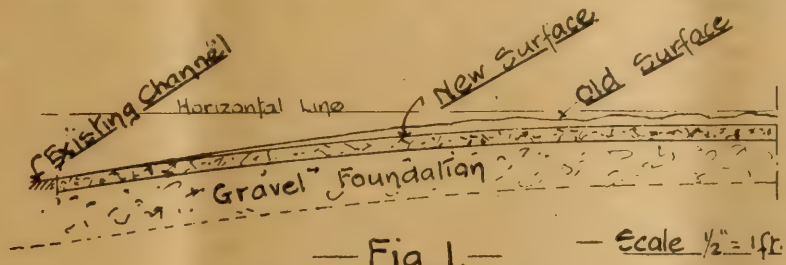
R. MEYER,
(3,287) Town Clerk.

SECOND HAND Small Sludge Press Wanted. State size and particulars.—Box 1,693, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (3,286)

War-Time Economy in Newport, Isle of Wight.

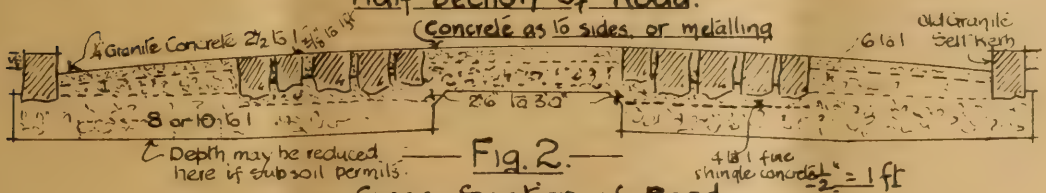
By E. A. SLATER, F.S.I., ASSOC.M.INST.C.E., Borough Surveyor and Water Engineer.

This war has not been altogether an unmixed curse; many of us have been driven by the pressing need of economy and the shortage of material to leave the beaten path of municipal work and attempt, with more or less success, to economise in new directions.



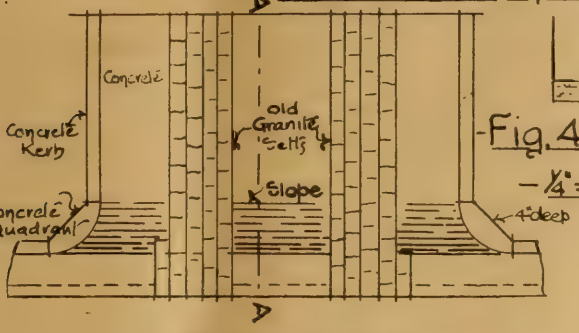
— Fig. 1. — — Scale ½" = 1ft. —

— Half Section of Road. —

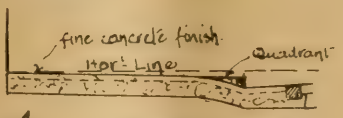

4 Granite Concrete 2½ 1 ½ ½ 1½
Concrete as 16 sides, or metalling
6 to 1
Old Granite Sett Kerb
8 or 10 to 1
2'6 to 3'0
Depth may be reduced here if subsoil permits
4 to 1 fine shingle concrete

— Fig. 2. — ½" = 1 ft

— Cross Section of Road —

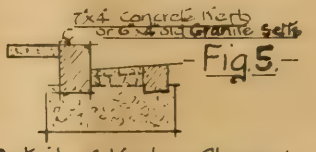


— Plan of Crossing. —



— Fig. 4. — — Section A.A. —

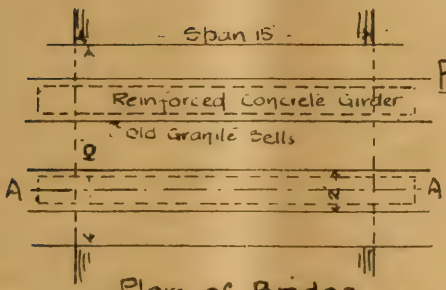
— ¼" = 1ft —



— Fig. 5. —

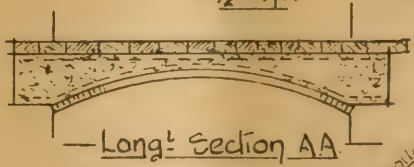
— Detail of Kerb on Channel —

— ½" = 1ft. —



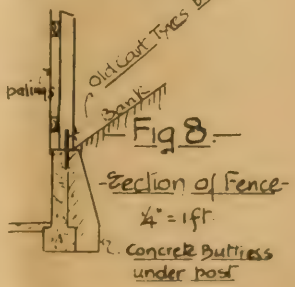
— Plan of Bridge —

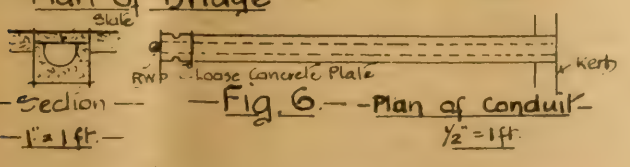
— Fig. 3. — ½" = 1ft.



— Long.l Section AA —

— Fig. 7. —





— Section — — Fig. 6. — — Plan of conduit —

— 1" = 1ft. — ½" = 1ft.

to try experiments which we should not have bothered about in normal times.

REFORMING ROADS INSTEAD OF RENEWING.

Referring to road repairs as an example, in the ordinary way, when the carriageway is worn, it is scarified and a layer of new macadam is spread and rolled. But supposing one has no granite or broken stone, and has no prospect of getting any, except at a fancy price. That has been our case; the only firm that tendered last February were unable to supply on account of war restrictions.

To repair granite with local gravel would, of course, have been a retrograde step. Two sections of a main central road had got in a bad state with deep potholes, and as stone could not be obtained, I decided to make them up without stone.

I will call one Section A. This was about 20 ft. wide, with a very steep crossfall, so steep that the

traffic naturally clung to the centre, wearing it into ruts, and there was still a fair amount of granite left on the boundaries. We just tore it up with a scarifier, lifted the granite and stacked it along on both sides. Then it formed the surface, as shown in Fig. 1, retaining the contour as much as we dared so as not to cut too deeply into the existing foundation in the centre. We then respread the old macadam, adding the boundaries somewhat to feed the crown, the only extra material being the binding gravel.

We may say that the least amount of material used was a minus quantity, as waste material was removed that supplied quite a good surface was obtained ready for the patent Mag coat which tar-painting adds to the road.

Section B was similarly treated, except that here the cross-section was not unduly steep, and the crown had been hollow. After lifting the macadam the contour was built up with coarse local gravel and rolled before re-spreading the granite. The cost was as follows: Section A, 2½d. per sq. yd.; section B, 3½d. per sq. yd.

COMPOUND ROADS.

Stone kerbs and setts must now be scarce and costly. Not that I have tried to buy any for years. Fortunately, there are many granite-sett crossings in this town, so that when we want any stone for kerbing or other purposes we go and dig up a crossing and put tar-macadam in its place. The crossing sweeper of early Victorian pre-tar-macadam days has disappeared, but the granite-sett crossing is still with us, and, although it resists the heaviest traffic, it has a nasty knack of causing the destruction of the road on each side of it. So I prefer to reverse the arrangement, taking out the transverse crossing and laying the setts longitudinally in narrow roads to form watersets.

Fig. 2 is a section of a road recently treated in this way, setting material from old crossings; and this is what I would call a compound road.

There has been some discussion lately on the method of laying setts. A prevalent idea is that they should be laid on concrete with an intervening layer of sand, which is supposed to act as a cushion. For some time past I have preferred to lay them not *on* but *in* the concrete, avoiding the laborious and tedious ramming with the heavy wooden rammer. The surface of the concrete foundation is kept a trifle full, the upper part being mixed with fine aggregate, and the setts merely tapped down with a hammer into the wet concrete till they come to the required level, so that the concrete comes up between the joints.

By this method old granite setts of varying depths can be used, no matter how irregular in shape they may be, provided that the top face, one only out of the six faces of each stone, is dressed. The wide, irregular joints are then determined when flushed up with cement grout, for which the screenings of shingle containing sand and grit up to ¼-in. gauge is better than ordinary sand. The concrete should be in two layers, and the bottom layer allowed to set partially before the top layer is applied, to avoid getting a spongy mass. If the top layer is very fine and mixed fairly wet, it will rise better between the setts.

I have found this construction to be successful under the heaviest traffic, and I think the practice ought to prolong the life of the road.

Let us compare the two methods, neglecting the supposed effect of the cement grouting in the joints, common to each. With the sand cushion the blow of a traffic engine which may come on to a single sett, and instantly transmits the blow to an area of concrete [illegible] But under the concrete foundation the granite setts are as one solid block of stone, the granite setts acting as a protecting surface against abrasion, one part cannot move separately from the other, and the combined structure has a power to distribute heavy loads over the subsoil practically through the depth obtaining under the old macadam method. It must be less liable to subsidence, a result gained simply doubling the depth of a girder [illegible] its effective.

With a treacherous subsoil it may be advisable still further to distribute the effect of the load by reinforcing. But in these times it should not be necessary to go to the expense of any patent system. I have a headstock bed and bedstead laths for this purpose at about £2 a ton, but feel better soil needs [illegible] may go up.

[illegible] The setts are laid with their [illegible] of the road, so as to avoid running [illegible] too much for wheels each [illegible] In this case the centre was finished with ordinary macadam to give better foothold to horses, and as the road was so narrow I thought it best to finish the width between the wheelers and the kerb on each side in concrete, as shown. In some cases, with a slow, heavy horse traffic, it would be advisable to treat the centre in the same way.

This is really, in effect, applying the principle of the railway track to roads, and it is a system which could, I believe, be applied with advantage to roads in France. Four of these tracks, corresponding to a double line of railway, could be made to withstand the severe stress of heavy artillery and lorries, which, combined with long-continued rain, must be too much for anything of the nature of tar-macadam. An objection might be made in regard to the time required for this work to set, but a week or so is not a long time—unfortunately—in this war. This system is also suitable for roads split up by tramways, where we get room for a single row of vehicles, or a little more perhaps, on each side, and on an incline. The space between the wheelers should be finished in macadam.

Fig. 3 shows another very narrow road, to be treated in the same way, which passes over an old brick-arched bridge. This bridge has recently become dangerous, and I propose to strengthen it by digging two longitudinal trenches down to the lowest ring, about 18 in. wide, leaving this ring in to save centering, and fill it with concrete reinforced with bedstead laths or otherwise, so forming two main girders under the wheels, which would also support the concrete layer to be spread over the whole surface.

This seems to me to open up a wider question. I have come to the conclusion that in the past we have been working on wrong lines in the construction of granite sett roads, with the result that they have got into disfavour on account, mainly, of their excessive noisiness.

I have been looking at this section of compound road which I have described, and which was laid about six months ago. The surface of the setts when laid was somewhat uneven, being old setts, roughly dressed by the mason. Now the surface of each track is quite smooth, and I should think almost as frictionless as railway metals. There has been constant traffic of heavily loaded fast-travelling Fodens (about 12 tons a time), and, owing to the unyielding nature of the bed, due to the tapping in wet concrete system, the rough edges or corrugations of the surface have been worn off by the cast-iron wheels, and now, although there will be necessarily a certain amount of wear, it will be approximately no more than that of a single solid block of granite. Cast-iron wheels will wear it gradually, because cast-iron is harder than granite, but heavy motor vehicles with rubber tyres could no more affect it than the housemaid could wear out a pane of glass by rubbing with her duster. There is no more noise than with a macadam road in good condition, and there must be a minimum of wear, because there is a minimum of resistance, due partly to the bed and partly to the longitudinal laying of the setts. The old setts used ran from 5 in. to 7 in. deep, but with new setts a depth of 3 in. to 4 in., according to the nature of the traffic, should be sufficient.

In future I should always recommend setts to be laid longitudinally (except for steep gradients), and it is a question whether it would not be advisable also for wood blocks (if properly bedded). We should get easier running, and should reduce that which is often the cause of trouble, the lateral expansion in wet weather between kerb and kerb.

CROSSINGS.

Fig. 4 shows what I consider to be the best construction for a footpath crossing. The usual method here, and in many towns, is to provide a heavy cast-iron plate, bridging over the channel, bearing on rebated stone borders. The chief objections are that the plates are apt to get broken, they work loose by the wearing of the rebates, and they harbour dirt. But they are preferable to the dropped crossing, which is especially dangerous now with little or no lighting. We have to study two conflicting interests, and generally a clear, uninterrupted path for pedestrians should be the first consideration and of greater importance than the provision of easy passage for the more occasional crossing of vehicles.

The method shown is a fair compromise; the rise from the channel can be obtained in a width of about 15 in., so that pedestrians can cross on the level, unless they walk too near the kerb. For heavy vehicles there could be a double row of granite setts, as suggested for narrow roads, but for ordinary carts or

rubber-wheeled motors all concrete would be quite good enough. A mould for making quadrant kerbs, as shown, about 4 in. deep, is a good investment.

Fig. 5 is a detail of a kerb and channel. For narrow streets and where there is a probability of wheels grinding the kerb, old deep granite setts may be used instead of concrete, and the sides of the channels we cut out of old Purbeck paving stone, 3 in. thick or over, and tap them into the wet concrete, as before. The space between these and the kerb is filled in with fine concrete, finished off with 1 in. thickness of ¼-in. granite and cement, 3 to 1.

This seems to me to be the correct solution. There is a minimum of worked stone, and that is mostly on the face and second-hand, so we get in effect a single block of material with a hardened face to resist abrasion, and a clean channel.

RAIN-WATER CONDUITS ACROSS FOOTPATHS.

These have usually been made of cast-iron half-round channels, with loose cast-iron covers, which are apt to break and work loose, and cost about 2s. 6d. per foot.

Fig. 6 shows the method which I now adopt at about one-third the cost. Fine concrete is tucked round a wood roll mould, and the hollow bridged-over with thin sheet iron, or old slates will do as well, if handy, leaving about 1 in. thickness of fine concrete over, and an uninterrupted path. A loose plate, as shown, next the wall gives access for cleaning.

INSPECTION PIT COVERS.

We now make drain inspection pit covers of concrete, with two ¾-in. irons bedded in for handles, as shown in Fig. 7. I prefer these covers bedded in mortar to the ordinary so-called airtight cast-iron covers. In nine cases out of ten on inspection it will be found that the cover is not airtight, that the fat or grease that may have been used to make it so is not there, or has been displaced. This is another of the many examples where concrete can take the place of iron with advantage.

FENCING.

Fig. 8 shows a cheap kind of fence put up in place of an old fence. The feet of the old posts had rotted, and were cut off and the upper parts utilised for the new fence, secured to the low concrete retaining wall by old cart tyres, as shown, so that there is no buried timber. The cart tyres make a more rigid and effective connection of the post to the concrete than a central dowel on account of their higher moment of inertia for the same weight of metal. The palings were removed from elsewhere, and the only new woodwork required was the 4-in. by 2-in. rails, which, it will be seen, are merely lapped and nailed to the posts, instead of being tenoned and so weakening the posts, and the palings drip clear of the concrete wall. I prefer all concrete, but now is hardly the time for laying money out on shuttering at the present price of timber, and an unreasonable price is being asked for cement. An economical fence, suitable for enclosing ground for potato growing, a subject very much to the fore just now, can be made with old boiler tubes driven in, in place of wood posts, and drilled for wire to pass through and for hooks to hold barbed wire.

A recent article by Mr. Percy Boulnois referred to the possible saving in fuel in municipal works. I believe that much can be done in that direction, and I have been able to reduce the cost of fuel at the outfall works by 100 per cent by using inferior fuel, such as breeze and waste screenings from a gas-producer plant, at times when full power is not required. Such fuel can be mixed with coke for a heating apparatus, and the finest screenings can be made into briquettes with tar. But this is a commercial economy, and I intended referring only to constructional matters in this article.

It will be seen that this paper deals only with small works of a small town, but whenever we find out any economical methods, or what we believe to be economical methods, my opinion is that we should not hug them at a time when economy is so essential, but pass them on for what they are worth, so that they may be adopted or criticised by others.

London Main Drainage System.—At a meeting of the Institution of Civil Engineers to be held on Tuesday next a paper, entitled "The Main Drainage System of London," will be read by Mr. G. W. Humphreys, the chief engineer to the London County Council. The chair will be taken at 5.30 p.m.

HIGHWAY AND SEWERAGE WORK AT SHEFFIELD.

(From a Correspondent.)

Municipal work in Sheffield is being cut down to the least possible figure. Highway work will, as far as possible, be confined to repairs and maintenance, though it will be understood that, even under present financial conditions, a great deal has to be done to keep the 400 miles of roads within the city in a state to carry the present abnormal traffic.

When the war ends, and such conditions as may be considered normal after the war are reached, a heavy expenditure will be necessary.

Thanks to the Road Board, Sheffield was fortunate in getting most of its outlying main roads resurfaced before the war, and these are standing the traffic remarkably well.

The chief trouble is with the paved roads, many of which have been seriously injured by the numerous steel-tyred tractors at present employed.

Sewerage work has come almost to a standstill, and private street works, upon which an average expenditure of £30,000 has been necessary for some years past, are suspended.

The traffic on the tramways is at present enormous, and when the war is over there is no doubt very heavy renewals will be necessary.

The expenditure of the department last year amounted to £153,649 (as against £238,808 for the preceding year), the figures for the coming year will not materially differ.

The expenditure on highways amounted to £38,877, as against an average of £78,685 for the five years preceding the war.

Timber, Plywood and Woodwork.—We would direct the attention of our readers to the full-page advertisement of Messrs. C. Jennings & Company, of Pennywell-road, Bristol, which appeared in our issue of last week. The information given in the advertisement should be of the greatest value to all users of timber, plywood or woodwork. We understand that the firm are prepared to answer any questions relating to the materials of which particulars were supplied, or furnish prices delivered to any part of the world, either of goods mentioned in the announcement or of others not included in it. They inform us that they hold stock at their branches and warehouses at Porthcawl (South Wales), Leyland and Pembroke Dock, Leicester, Swansea, Hull, Liverpool, Manchester, Newcastle and other places, and will be pleased to receive inquiries.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

DISTRICT ROAD SURVEYOR.—February 3rd.—Oswestry Rural District Council.—Mr. Charles H. Bull, clerk, Rural Council Offices, Oswestry.

TEMPORARY ROAD FOREMAN.—February 5th.—Merton and Morden Urban District Council. £2 15s. per week.—Mr. G. Jerram, engineer and surveyor, Council Offices, Kingston-road, Merton, Surrey.

TEMPORARY SURVEYOR AND INSPECTOR.—February 6th.—Ruislip-Northwood Urban District Council. £200 a year.—Mr. Edmund R. Abbott, clerk, Council Offices, Oaklands Gate, Northwood, Middlesex.

ENGINEERING FITTER.—February 8th.—Gosport and Alverstoke Urban District Council. £2 7s. 6d. per week.—Mr. H. Frost, surveyor, Council Offices, Gosport.

TEMPORARY QUALIFIED ASSISTANT.—February 9th.—Mr. F. Wilkinson, borough engineer, Town Hall, New Cross-road, London, S.E.

TEMPORARY SURVEYOR AND SANITARY INSPECTOR.—February 12th.—Sherborne Urban District Council.—Mr. H. J. Seymour, clerk, Sherborne, Dorset.

SURVEYOR.—February 14th.—Totnes Rural District Council. £130 per annum.—Mr. J. S. Portch, deputy clerk 19 High-street, Totnes.

SURVEYOR'S ASSISTANT.—February 14th.—Aldershot Urban District Council. £2 2s. per week.—Mr. D. Llewellyn Griffiths, clerk.

HIGHWAY SURVEYOR.—February 14th.—Liskeard Rural District Council.—Mr. A. de C. Gubb, clerk, Council Offices, Liskeard, Cornwall.

INSPECTOR OF NUISANCES.—February 17th.—Chatham Local Board. £200–£250.—Mr. J. Holgate, medical officer of health, Town Hall.

SANITARY INSPECTOR.—Government of Nigeria. £250–£300.—Crown Agents for the Colonies, 4 Millbank, Location, S.W.

STOREKEEPER.—Sheffield Corporation Water Department.—Mr. William Terrey, general manager, Water Department, Town Hall, Sheffield.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, but those responsible for their despatch are recommended to arrange that they shall reach The Surveyor office by noon on Wednesdays to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

SHEFFIELD.—February 6th.—For the erection of a transformer sub-station, for the Electric Supply Committee.—The Manager, Commercial-street, Sheffield.

LOUTH.—February 28th.—For the erection of bathrooms at the county infirmary.—Mr. V. J. O'Connell, architect, Eastgate, Louth.

Engineering: Iron and Steel.

WOODFORD.—February 6th.—For the supply and erection of two 15–16 b.h.p. gas engines (Crossley, National, Stockport, or Tangyes), and two Stereo-plunger pumps, at the eastern sewage works, for the urban district council.—Mr. W. Farrington, surveyor, Council Offices, Woodford Green, Essex.

FRESHWATER, I.W.—February 10th.—For repair of the esplanade, for the parish council.—Mr. J. Gilbert, clerk, Attabella, Heathfield-road, Freshwater, I.W.

GLASGOW.—February 19th.—For the supply of gas-cookers and grillers, for the corporation.—Mr. A. Wilson, 15 John-street, Glasgow.

Mechanically Propelled Vehicles.

MANCHESTER.—February 6th.—For the supply of a light motor van, for the Board of Guardians.—Mr. J. Macdonald, clerk, Union Offices, All Saints, Manchester.

MANCHESTER.—February 9th.—For the supply of an electric tipping wagon, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall, Manchester.

MANCHESTER.—February 19th.—For the supply of [illegible] sweeping machines, for the Cleansing Committee.—Mr. R. Williamson, superintendent Cleansing Department, Town Hall.

WATERFORD.—For the supply of a high-pressure steam-propelled motor tractor, or light compound motor traction engine, and four suitable tipping wagons, new or second-hand, for the county council.—Mr. [illegible], surveyor, Dungarvan.

Roads.

EAST RIDING.—February 5th.—For the supply of about 2,000 tons of stone for macadamising the main roads, for the county council.—The County Surveyor, Beverley.

LITTLE HULTON.—February 5th.—For the supply of broken granite, 4 by 2 granite, tar-macadam, [illegible] and [illegible] chipping, etc., for the Chamber [illegible] and [illegible] road rolling for the urban district council.—Mr. J. H. Hesse, clerk, Council Offices, Little Hulton, Bolton.

SUNBURY-ON-THAMES.—February 5th.—For the supply of about 1,000 tons of ordinary tar for the urban district council.—Mr. H. F. Crabb, surveyor, Council Offices.

SUTTON-IN-ASHFIELD.—February 5th.—For the supply of [illegible] and limestone for the urban district council.—Mr. W. Barn, surveyor.

RUGBY.—February 6th.—For supplying horses and carts for road repairs, watering streets, and watering for the ensuing financial year.—Mr. J. H. Sharpe, Estate Buildings, Rugby.

RENFREW.—February 5th.—For the supply of metal, borders, setts, and chippings, for the Upper District Committee.—Mr. R. Drummond, road surveyor, Fairfield, Paisley.

HIPPERHOLME.—February 6th.—For the supply of 2½-in. granite macadam, for the urban district council.—Mr. G. Wharton Thompson, engineer and surveyor, Council Offices, Hipperholme.

SWANSEA.—February 6th.—For the supply of about 12,000 or 15,000 gallons of best quality distilled tar, for the rural district council.—Mr. Edward Harris, clerk, Council Offices, Alexandra-road, Swansea.

MIDDLESEX.—February 7th.—For the cartage of about 7,500 tons of broken stone, 2,000 tons of chippings, about 4,000 tons of gravel, hoggin, and shingle, horsing slop carts, water vans, tarring machines, rotary brooms and scrapers, and the hire of horse, cart and van per day, for the county council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster, S.W.

STOCKPORT.—February 7th.—For the supply of manual and team labour for paving and repairing carriageways, manual and team labour for mason's work on footpaths, and team labour for carting other materials, for the corporation.—Mr. John Atkinson, borough surveyor, Borough Surveyor's Office, Town Hall, Stockport.

TRING.—February 7th.—For the supply of blast-furnace slag, granite chippings, refined tar, flints, and hoggin, for the urban district council.—Mr. S. S. Gettings, surveyor, Surveyor's Office, Tring.

MIDDLESEX.—February 7th.—For the supply of about 7,500 tons of 2-in. and 1½-in. hand-broken basalt, and 500 tons of ¾-in. clean chippings, for the county council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster.

LITTLEHAMPTON.—February 7th.—For the supply of distilled tar, for the urban district council.—Mr. W. A. Clegg, engineer and surveyor.

EASINGWOLD.—February 7th.—For the supply of whinstone and slag, for the rural district council.—Mr. F. J. H. Robinson, clerk.

GRAYS THURROCK.—February 8th.—For the supply of 400 tons, or thereabouts, of basalt or granite chippings, for the urban district council.—The Surveyor, High-street, Grays.

BEXHILL.—February 9th.—For the supply of distilled tar, Tarvia, or other compounds for use in tar-spraying, for the corporation.—Mr. T. E. Rogers, town clerk, Town Hall, Bexhill.

REIGATE.—February 9th.—For the supply of granite, flints, Kentish ragstone, tar-macadam, gravel, chalk, haulage, team labour, and tar washing, for the rural district council.—Mr. A. J. Head, surveyor, 48 High-street, Reigate, Surrey.

UXBRIDGE.—February 9th.—For the supply of granite, tarred granite and slag, gravel, flints and hoggin, and haulage, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor, Corn Exchange, Uxbridge.

CAISTOR.—February 9th.—For the supply of about 5,000 tons of granite, about 5,400 tons of slag, about 550 tons of slag chips, and 200 tons of tar-macadam, for the rural district council.—Mr. A. A. Padley, clerk, Council Offices, Caistor, Lincs.

HEADINGTON.—February 10th.—For the supply of the best selected granite, broken and unbroken, and unscreened ½-in. granite chippings, for the rural district council.—Mr. A. Walker, district surveyor, Windmill-road, New Headington.

GLAMORGAN.—February 10th.—For the supply of materials and haulage, for the county council.—Mr. G. A. Phillips, county surveyor, County Hall, Cardiff.

HEMEL HEMPSTEAD.—February 10th.—For the supply of granite, for the corporation.—Mr. W. R. Locke, borough surveyor, Town Hall.

BRIDGWATER.—February 10th.—For the supply of tone and Tarmac, for the rural district council.—Mr. W. H. Cousins, surveyor, Union Workhouse, Bridgwater.

HERTS.—February 10th.—For surface tarring approximately 1,250,000 sq. yds. of main roads with refined tar, for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

CORNWALL.—February 10th.—For the hire of steam rollers, not exceeding ten, for a period of one year, for the county council.—Mr. L. D. Thompson, county surveyor, County Hall, Truro.

HERTS.—February 12th.—For the hire of steam and petrol rollers, for the county council.—Mr. J. S.

Killick, county surveyor, County Surveyor's Office, Hatfield.

BIRKENHEAD.—February 12th.—For the supply of granite and Rawtenstall kerbs and channels, Penmaenmawr macadam stone and natural flags, and stoneware pipes, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor, Town Hall, Birkenhead.

BUCKS.—February 12th.—For the supply of clean, hand-picked field flints, for the county council.—Mr. E. Winfield, acting county surveyor, County Hall, Aylesbury.

WALTHAM ABBEY.—February 12th.—For tar-spraying about 75,000 sq. yds. of roads, for the urban district council.—Mr. W. C. Holloway, engineer and surveyor, Town Hall, Waltham Abbey.

NORTHUMBERLAND.—February 12th.—For supplying, breaking and carting stone, for the county council.—County Surveyor, Moothall, Newcastle-on-Tyne.

LONG SUTTON.—February 13th.—For the supply of granite, slag, and granite chippings, for the urban district council.—Mr. S. S. Mossop, clerk, Long Sutton, Lincs.

CLAYPOLE.—February 15th.—For the supply of about 1,800 tons of granite, 1,200 tons of slag, and 140 tons of footpath gravel, for the rural district council.—Mr. C. G. Else, district surveyor, Brant Broughton, Newark.

NEWMARKET.—February 15th.—For the supply of about 1,000 tons of the best broken Leicestershire granite, 1¼-in., 2-in., and 2½-in. gauge, 200 tons of best broken slag, 2½-in. gauge, 500 tons of granite or slag chippings, free from dust, ¾-in. gauge, and 250 tons of ¾-in. tarviated granite chippings, for the urban district council.—Mr. W. H. Eley, engineer and surveyor, Town Hall, Newmarket.

WETHERBY.—February 15th.—For the supply of refined tar in accordance with the Road Board specifications, for the rural district council.—Mr. E. H. Coates, clerk, Rural Council Offices, Wetherby, Yorks.

HORSHAM.—February 17th.—For the supply of about 15,000 gallons of tar, for the rural district council.—Mr. W. Dengate, surveyor, 58 Park-street, Horsham.

THAKEHAM.—February 17th.—For the supply of broken basalt or granite, unbroken flints, and refined tar, for the rural district council.—Mr. W. Forrester, surveyor, Storrington, Pulborough, Sussex.

KINGSBURY.—February 17th.—For the supply of Leicestershire granite and granite chippings, ironstone slag, Derby limestone, broken pit or dug flints, hoggin, shingle cartage, and tar-spraying, for the urban district council.—Mr. R. C. N. Newport, surveyor, Council Offices, Kingsbury, Middlesex.

FORFAR.—February 17th—21st.—For quarrying and carting breaking materials for the highways, for the Forfar district.—Mr. A. Lindsay, 12 Reform-street, Kirriemuir.

WANSTEAD.—February 21st.—For the supply of cartage and team labour, for the urban district council.—Mr. B. Blewitt, clerk.

BOLSOVER.—February 21st.—For the supply of granite, limestone, slag, basalt, tarred limestone, tarred slag, refined tar, pitch, kerb, channel, sand, and stoneware pipes, for the urban district council.—Mr. J. F. Wardle, town surveyor, Council Offices, Bolsover, near Chesterfield.

MARPLE.—February 23rd.—For the supply of granite macadam and chippings, Macclesfield macadam and chippings, 6-in. grit stone setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

ROTHERHAM.—February 24th.—For the supply of granite slag and tarred macadam, for the rural district council.—Mr. R. Bradbury, district surveyor, Imperial Buildings, Rotherham.

MILNGAVIE.—For the supply and spreading of road metal, for the corporation.—Mr. T. M'Intyre, burgh surveyor, Milngavie, Scotland.

Sanitary.

ROWLEY REGIS.—February 6th.—For emptying and removing house refuse, for the urban district council.—Mr. D. Wright, clerk, Council Offices, Old Hill, Staffs.

LEEDS.—February 13th.—For the supply of press filter-cloths at Knostrop sewage works, for the Sewerage Committee.—Sewerage Engineer, Great George-street, Leeds.

BLAYDON-ON-TYNE.—February 13th.—For the removal and disposal of refuse, for the urban district council.—Mr. R. Biggins, Council Offices.

AYLESBURY.—February 17th.—For the collection of refuse, for the rural district council.—Mr. R. T. S. Stewart, sanitary surveyor and inspector, Council Offices, 21 Walton-street, Aylesbury.

SMALLTHORNE.—February 28th.—For scavenging the Packmoor area, for the urban district council.—The Sanitary Inspector, Smallthorne, Staffs.

Stores.

STOCKPORT.—February 7th.—For the supply of Dalbeattie and Welsh granite setts, Welsh granite, broken for macadam, Lancashire lonkey and Lancashire grit setts, flags, kerbs, granite concrete flags, Portland cement, earthenware and stoneware pipes, iron castings, pitch, creosote oil, limestone chippings and lime, for the corporation.—Mr. John Atkinson, borough surveyor, Borough Surveyor's Office, Town Hall, Stockport.

SALISBURY.—February 9th.—For the supply of brushes, refined tar, oils, and disinfectants, for the corporation.—City Engineer and Surveyor, Endless-street, Salisbury.

IRLAM.—February 9th.—For the supply of broken granite, tarred slag, kerbs, setts, stoneware pipes and gullies, cement, hire of steam roller, pitch and creosote oil, disinfectants, scavenging brooms, iron castings, and team labour, for the urban district council.—Mr. R. H. Winterbottom, surveyor, Council Offices, Irlam, Lancs.

HALIFAX.—February 12th.—For the supply of materials for the tramways department, for the corporation.—Tramways Engineer, Tramways Offices, Skircoat-road, Halifax.

BIRMINGHAM.—February 12th.—For the supply of granite kerbs, setts, crossing stones, chippings, flags, paving bricks, wood-paving blocks, ragstone, limestone, tarred limestone, tarred roadstone, gravel, sand, slag, lias lime, Portland cement, and stoneware pipes, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor, The Council House, Birmingham.

CHELTENHAM.—February 14th.—For the supply of clothing, castings, disinfectants, electric light fittings, forage, household goods and sundries, ironmongery, indiarubber goods, lime, bricks and sand, lead pipe, sheet lead and block tin, oils, colours, Portland cement, stoneware pipes, tools, timber, wrought iron, steel and files, for the corporation.—Mr. J. S. Pickering, borough engineer, Municipal Buildings, Cheltenham.

RAWTENSTALL.—February 15th.—For the supply of road metal, earthenware pipes, gullies, timber, pitch, creosote oil, disinfectants, Portland cement (British), iron castings, local stone (flags and setts), workmen's tools, scavenging brushes, horse-shoeing, coal and coke, carting, and team labour, for the corporation.—Borough Surveyor, Town Hall, Rawtenstall.

STOKE-ON-TRENT.—February 17th.—For the supply of various materials and goods for the year 1917-18.—Mr. E. B. Sharpley, town clerk.

STAFFORD.—February 17th.—For the supply of ironmongery, tools, timber, castings, water fittings, stoneware pipes, brooms, cement and lime, bricks, paving setts, road stone, and ironstone furnace slag, for the corporation.—Mr. W. Plant, borough engineer, Borough Hall, Stafford.

DONCASTER.—February 19th.—For the supply of roadstone and setts, kerbstone, flags, slag or furnace dross, tarred slag and limestone, pitch, creosote oil and refined tar, sand and gravel, drainage pipes, blue channel bricks, bricks, cement, brooms, paints, picks and shovels, oils, paraffin, cotton wastes, and disinfectants, for the corporation.—Mr. R. E. Ford, acting borough surveyor, Mansion House, Doncaster.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.

MERTHYR.—For supplying and laying 760 yds. of 12-in. and 9-in. stoneware pipes, for the Merthyr and Aberdare Joint Farms Management Committee.

J. Williams & Sons, Merthyr £ [illegible]
J. Murray, Mountain Ash [illegible]
D. Jones, Dawlais [illegible]
Blackburn & Evans, Treharris, Glamorganshire [illegible]
J. Sutherland, Abercynon, Glamorganshire [illegible]

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY.

5. Institution of Civil Engineers of Ireland. Mr. F. C. Urey on "Recent Practice in the Purification and Softening of Public Water Supplies." 8 p.m.
6. Institution of Civil Engineers. Mr. G. W. Humphreys, M.INST.C.E., on "The Main Drainage System of London." Paper for new members. 5.30 p.m.
7. Town Planning Institute. Prof. S. D. Adshead on "Monumental Memorials and Town Planning." 6 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ALDERSHOT URBAN DISTRICT COUNCIL.
SURVEYOR'S ASSISTANT.

The Committee of Urban District Council of Aldershot invite applications for the above appointment, for a period not exceeding the duration of the War. The engagement will be terminable by one month's notice on either side.

Salary, £2 2s. per week.

Candidates for the position should have had experience in the use of Surveying Instruments, Plotting, the routine of a Surveyor's Office, the preparation of Architectural Drawings and Designs, the Inspection of New Buildings and Drainage Works under the Council's By-laws, and the preparation of Specifications.

The candidate appointed will be required to devote the whole of his time to the service of the Council.

Applications, in candidate's own handwriting, stating age, whether married or single, previous experience, present employment, and accompanied by not more than three recent testimonials, must be addressed to me at the Municipal Buildings, Aldershot, not later than the 14th day of February, 1917, endorsed "Surveyor's Assistant."

(Signed) D. LLEWELLYN GRIFFITHS,
Clerk to the Council. (3,281)

SHERBORNE URBAN DISTRICT COUNCIL.
APPOINTMENT OF (TEMPORARY) SURVEYOR AND SANITARY INSPECTOR.

The above Council invite applications for the appointment of Surveyor and Sanitary Inspector, subject to one month's notice on either side. Applicants must be ineligible for military service, and be good Draughtsmen and Surveyors, and have efficient knowledge of all departments of a Municipal Engineer's Office, including all Sanitary matters, Sewage Works, Waterworks, Maintenance of Roads, &c., and must hold the Certificate of the Royal Sanitary Institute, and be fully competent to carry out the duties appertaining to the respective offices.

He will be required to commence duties at the end of April next.

Applications, endorsed "Surveyor," stating age, experience, qualifications, and salary required, accompanied by copies of three recent testimonials, to be sent to the undersigned, from whom further particulars may be obtained, on or before Monday, February 12th next.

H. J. SEYMOUR,
Clerk to the Council.
Sherborne, Dorset. (3,282)

TEMPORARY Qualified Assistant required at once for period of War. Applicants must be ineligible for Army. Municipal experience essential. Applications, giving all particulars, and salary required, to F. Wilkinson, ASSOC.M.INST.C.E., Borough Engineer, Town Hall, New Cross-road, S.E., to be received not later than Friday, 9th February. (3,279)

MISCELLANEOUS.

FOR SALE. Volumes of SURVEYOR, bound in publishers' covers, also loose numbers to date, also Vols. XXV. to XXXII. of "Proceedings" of Institution of Municipal and County Engineers, publishers' covers and loose numbers with binding covers to date, all in perfect condition.—Samuel Turner, Surveyor, Ashby-de-la-Zouch. (3,278)

TENDERS WANTED.

COUNTY BOROUGH OF STOKE-ON-TRENT.

The Council invite Tenders for the Supply of Materials and Goods for the year ending 31st March, 1918, as under:

1. Portland Cement.
2. Blue Paving Bricks and Common Bricks.
3. Sanitary Pipes and Gullies.
4. Kerbs and Setts.
5. Macadam and Chippings.
6. Pitch and Creosote Oil.
7. Cast-iron Work.
8. Picks, Shovels, and General Ironware.
9. Paints and Oils.
10. Soap, Soda, &c.
11. Brooms and Brushes.
12. Bath Towels, Dusters, &c.
13. Ironmongery and General Stores.
14. Disinfectants.

Specifications, Conditions, and Forms of Tender may be obtained on application to the Borough Surveyor, Town Hall, Stoke-on-Trent, and Tenders, sealed and endorsed, must be delivered to him on or before the 17th February, 1917.

E. B. SHARPLEY,
Town Clerk.

Town Hall,
Stoke-on-Trent.
February, 1917. (3,280)

CORPORATION OF RAWTENSTALL.
TENDERS FOR MATERIALS, LABOUR, COAL, AND COKE.

The Corporation of Rawtenstall invite Tenders for the Supply of the following:—

Road Metal, Earthenware Pipes, Gullies, Timber, Pitch, Creosote Oil, Disinfectants, Portland Cement (British), Iron Castings, Local Stone (Flags, Setts, &c.), Workmen's Tools, Scavenging Brushes, Horse-shoeing, Coal and Coke for Depots and Schools; also for the Carting of Road Metal from the railway stations, and for Team Labour.

Forms of Tender can be obtained on application to the Borough Surveyor, Town Hall, Rawtenstall. Sealed Tenders, endorsed with the names of the Articles tendered for, must reach the Town Clerk's Office, Rawtenstall, not later than Thursday, the 15th instant. The Corporation do not bind themselves to accept the lowest or any Tender.

N.B.—Tender Forms will not be issued unless applied for, and no Tender will be considered that is not delivered within the prescribed time.

(By order)
JAMES WHALLEY,
Town Clerk.

Town Hall, Rawtenstall.
February 2, 1917. (3,276)

CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive Tenders for the Supply of Materials for one year, ending March 31, 1918—viz.: Granite Kerbs, Setts, Crossing Stones, Chippings, Flags, Paving Bricks, Wood-paving Blocks, Ragstone, Limestone, Tarred Limestone, Tarred Roadstone, Gravel, Sand, Slag, Lias Lime, Portland Cement, and Stoneware Pipes.

Forms of Tender, Copies of Conditions, and Specifications may be obtained on and after the 1st inst., at the City Surveyor's Office, Council House, Birmingham, on payment of £1 for each copy, which will be returned on the receipt of a *bonâ-fide* Tender, for the whole or any portion of the Materials required. Samples of Materials tendered for must be sent, carriage paid, to the undersigned. Tenders must be made out on the Forms provided, and delivered at the undermentioned Offices on the 12th day of February, 1917, endorsed "Tender for Paving Materials, &c.," and addressed to the City Surveyor, Council House, Birmingham. The person whose Tender may be accepted will be required to conform with the provisions of the Trade Board's Act, 1909, and to provide approved sureties in sums of £300 each for the due performance of the Contract. The Committee do not pledge themselves to accept the lowest or any Tender, and reserve the right to accept portions only of a Tender.

HENRY E. STILGOE,
City Engineer and Surveyor.

The Council House,
Birmingham.
February 1, 1917 (3,277)

The Surveyor

And Municipal and County Engineer.

Vol. LI. FEBRUARY 9, 1917. No. 1,308.

Minutes of Proceedings.

Waterworks Design.

It is the duty of the modern water engineer to take into account the bearing which new discoveries and methods may have upon the design of new undertakings. The possibilities and advantages of electrical power produced at a central station and available at various points in a district are something which may well change the whole conception of a scheme under certain conditions. The power of purifying the most polluted water to a high standard is another all-important factor, while the freedom from incrustation of mains, rust, and clogging, which is to be obtained by water treatment, does away with a certain element of uncertainty which has given much trouble in the past. Again, a means of rapidly increasing the pressure in any main or section of mains, so as to provide an efficient fire service, is provided by the electrical pump, which may under certain conditions do away with a high service reservoir, together with pumps, mains, and plant constituting a very expensive item of first cost.

The waterworks at Aurora, Illinois, provide an example of the application of electrical energy to the problem of water supply which is well worthy of attention. A description of the works is given in New York *Engineering News*. The City of Aurora obtains its principal supply from a group of deep wells at the waterworks, but in order to increase this supply other wells have been sunk in different parts of the city, having their own electric pumping plants so as to form independent units. Auxiliary pumps provide for increasing the pressure in the mains in case of fire. A number of deep wells have been sunk in the city, generally near street intersections, so that the water which is pumped directly into the mains may travel in four directions and may have the shortest possible distance to flow before being consumed, thus reducing the friction loss in the mains to a minimum. One can see at once that we have a system in which the cost of pumping and water mains is very small. Against this saving in first cost one must not forget the cost of making the wells. However, the idea is fascinating, and there must be many cases in which the principle could be applied with great advantage, saving large and complicated distributing systems, and possibly making use of a supply of water which could not be tapped in sufficient volume at any one point, but which might, however, be tapped in ample quantity at many points considered collectively.

Twenty-five years ago many persons were of opinion that the proper source of supply for London was the water bearing chalk, which extends everywhere below the area to be supplied. Although the idea was ultimately considered impracticable, it is yet a fact that this underground reservoir is sufficiently useful, and forms an important auxiliary supply. But each well has its own separate engine and pump and a system of mains, tanks, and so forth. In the London area there are several hundred wells, from which private supplies are procured in the middle of the district of the Metropolitan Water Board. If the expense of first cost, pumping, and distribution were ascertained, it would probably be seen that this auxiliary supply is collectively a very extravagant matter, yet it exists even in a district possessing a very perfect system of distributing mains with an ample quantity for supply where it ought to be unnecessary. If this is the case, even in London, it is evident that in the design of new systems such auxiliary sources of supply may be very important, and that the adaptation of electrical pumping may make them possible and lead to a great saving of money.

* * *

Local Authorities and the War Loan.

So much depends upon the success of the huge War Loan now being raised that we have no hesitation in referring to the matter in these columns. Our immediate purpose is not to appeal to our readers personally to do their utmost to help the loan—we are confident that any such appeal would be quite superfluous—but to point out the various ways, both direct and indirect, in which local authorities can render valuable help. These are well summarised in a circular which has just been issued by the Local Government Board. In the first place, it is pointed out that in the case of such funds as sinking and redemption funds for the repayment of loans, superannuation funds, reserve and depreciation funds, and other moneys which local authorities are required or authorised to invest, the new War Loan is an authorised and desirable security for the investment. Where the direction or approval of the board is required before the investment can be made, the department are quite ready to give it, and it is indicated that a local authority may make arrangements with their bankers to enable them to invest in the loan, in advance, moneys which they will in the ordinary course have avail

able for investment within a reasonable period. The question of the investment of revenue balances is perhaps a little more controversial, and that part of the circular which deals with this subject is very properly couched in guarded language. The department consider that local authorities may invest in the loan such part of their revenue balances as is not likely to be required in the near future for meeting their expenditure. Many local authorities have at present large balances due to normal times, in consequence of their diminished expenditure resulting from the postponement of works of maintenance and repair, and the department think such balances may be invested in the loan instead of being applied to the reduction of the next rate. Although any balance of rate moneys, whether invested or uninvested, must be taken into account in framing the rate estimates, a local authority are not bound by law to reduce the forthcoming rate in respect of the amount invested if there is a possibility that the full amount may, under altered circumstances, be required to defray expenditure for the period to be covered by the rate. Finally, the circular casts a new, though optional, duty on local authorities, as it authorises an arrangement with bankers by which they could purchase a certain amount of War Loan Stock and institute a scheme for enabling persons of small means in their district to purchase such stock by instalment payments spread over a period longer than that for the payment of instalments under the loan prospectus. It is stipulated, however, that no charge on the rates shall be involved. We feel sure that local authorities throughout the country will heartily co-operate with the Government in this important matter.

* * *

Glasgow Corporation and Cottage Homes.

When the Glasgow Corporation discussed recently the proposed scheme to erect from twenty to thirty tenements after the war, an amendment was proposed that instead of tenements 300 cottage homes should be built on sites to be determined upon afterwards. The argument of the proposer, Mr. Charlton, was that, it being agreed that an improvement should be made in the class of house to be provided, this could be best attained by the erection of cottages. At the same time he contended that the corporation should set the standard now, which in time would be universal, and not "perpetuate the horrible tenement system." The question of sites for the cottages appeared to be quite a stagger to Treasurer McMillan that it quite upset his mental balance, his view being that to carry out the proposal to extensively would require all Lanarkshire, Renfrewshire, Dumbartonshire, and Stirlingshire. Parenthetically it may be stated that sites of the extensive area here mentioned have been defined, and there is not therefore any assurance that they will be secured without the difficulties which ordinarily confront corporate bodies when they go land-buying. Bailie Stewart was able to see no way out of the dilemma but the hypothetical erection of tenements when he stated that if they were to extend the city by 12 miles in the circumference they would have the whole of the population of the country there. There was, of course, little hope for the amendment to erect cottages, which was eventually defeated by seventy-seven votes to fourteen, but it was certainly significant that Mr. Charlton, chairman of the Special Committee who reported on the question, had nothing to say in opposition to cottages. His excuse for opposing the amendment was based upon the financial aspect, by doing away with the tenements. This was a mere excuse, and must remain so unless and until it is conclusively proved that a scheme for the provision of cottages could not be completed within a reasonable time limit. But Mr. Morton gave his case away when he proceeded to eulogise the class of cottages which the Government are erecting at Tollcross, which, he declared, are a splendid example of what can be done in cottage building, and which the Government are proposing the Glasgow Corporation should take over after the war. It is possible, and indeed quite probable, that the experience of these cottages may help to overcome the prejudice which so many members of the corporation entertain against this particular class of dwelling.

* * *

Urban Land Cultivation.

In December last we drew attention to the then recent Order of the Board of Agriculture and Fisheries, by which powers were conferred on certain local authorities with regard to the cultivation of land in urban areas for the purpose of increasing the home-grown food supply. The matter has been taken up with vigour in many districts, and with a view to guiding into proper channels the efforts that are being made, an important circular letter has just been issued jointly by Lord Rhondda and Mr. Prothero. This circular is directed in the first place to securing effective local organisations for the purposes of the scheme. It is pointed out that full effect cannot be given to the Order unless there is a real driving power in each district. As a rule, this driving power must come from the local authority, and it is therefore desirable that, where satisfactory measures have not been adopted by voluntary organisations, the local authority should immediately take all necessary steps to secure a full cultivation of available land within their district. For this purpose it is suggested that it may be well to appoint a working committee which will inspire general confidence to carry the scheme into full execution. Another innovation indicated in the circular is the direct cultivation of vacant lands by local authorities themselves. Thus, although the primary aim of the scheme is to promote and encourage the voluntary efforts of inhabitants to cultivate available lands in their spare time, objection will not be taken to direct cultivation by a local authority who, having possession of a suitable piece of land, find that they cannot dispose of it to cultivators, and that the only alternative to direct cultivation would be to leave the land idle. The adoption of this course, however, would only be justified if it would enable advantage to be taken of spare labour which would not in any case be employed on food cultivation. Other points with which the circular deals are the necessity for securing the active co-operation of women, the partial repayment in certain circumstances of expenditure in excess of the grant of £2 per acre already announced, and the release of lands cultivated under the Order from liability for the repayment of rates.

* * *

Public Conveniences and Nuisances.

The selection of suitable sites for the placing of public urinals is a duty in the discharge of which local authorities must inevitably run the risk of offending individuals, and cases arise from time to time in which injunctions are sought to restrain them from placing these ameliorations in necessary structures in some particular spot. An example occurred recently in the Penge Urban District, the council of which erected a public urinal adjoining some dwelling houses, under their power derived from the Public Health Act, 1875, to "provide and maintain urinals in proper and convenient situations."

Thereupon the owner and occupiers brought an action against the council, alleging that the structure was a nuisance by reason of its position, construction, and user, and in the course of the hearing the whole question of the extent of the powers of local authorities in regard to this matter was discussed. To begin with, it appears from the judgment of Mr. Justice Astbury to be quite clear that a local authority has no right to erect a convenience which in fact is, or which constitutes, a nuisance to adjoining houses. In the next place it was definitely held that the mere placing of a public convenience near to or adjoining a dwelling-house is not sufficient in itself, and apart from other circumstances, to constitute a nuisance. On the contrary, a plaintiff, in order to succeed, must show that the structure as used, and having regard to its situation and the requirements of the neighbourhood, has caused a legal nuisance to him. On the facts of the particular case, the learned judge found that the council had exercised their powers in good faith, and that the mere presence of the convenience in the situation in which it had been placed did not constitute a nuisance to the plaintiffs, but, inasmuch as there was a chance of a nuisance by reason of the open roof and certain openings at the back of the urinal, he made an Order restraining its use until these defects were remedied.

* * *

Building By-laws.

In letters to the *Times* and other newspapers, Mr. Gordon Allen, F.R.I.B.A., has once again raised the question of the need for revision of existing building by-laws. In doing so, however, we venture to think that he puts his case too high when he says that "all building by-laws have long become obsolete." It is, of course, beyond argument that building in many individual districts is subject to codes of by-laws which were made in the early days of the by-law era, and we have never ceased to urge that in these cases the by-laws should be revised and brought up to date without delay. Those who make light-hearted attacks on by-laws as such are apt to forget, or grossly to under-estimate, the very useful functions that they have performed and continue to perform in the regulation in the interests of the working population of the gentle art of the jerry-builder. Mr. Allen's precise proposal is not quite clear, for while in one letter he says that "the *abolition* of many of these obsolete and inconsistent enactments is now a matter of national importance," he admits in another place that it is essential "to keep up a high sanitary standard and to prevent flimsy construction." Again, while complaining of the inconsistencies which undoubtedly exist between the codes of by-laws in operation in different districts, he asks at the same time for differentiation according to the character of localities. On this part of his case, too, his major premiss is grossly exaggerated when he alleges that "no two local authorities have similar by-laws." We fully admit that the present system is not without serious defects, but it will certainly need more careful criticism than that of Mr. Allen if the model code, capable of variation to suit the needs of particular areas, is to be superseded by some more efficient plan.

* * *

Road Services in France: A Complaint.

The appeal that was made some time ago to highway engineers to volunteer for service in connection with roads in France received a very wide response, and many municipal engineers have, to our knowledge, found in this work the opportunity which they had been seeking of applying their professional skill directly to the winning of the war. On the other hand, many surveyors above military age offered their services, and, to judge from letters which reach us, have not even been favoured with an acknowledgment. This certainly points to some defect in organisation, and although in the present pressure perfection in arrangement cannot always be expected, it is only by calling public attention to defects that they are likely to be remedied. While speaking on this subject, we may perhaps refer to another complaint made in the columns of the *Newcastle Daily Journal* under the heading "Official Muddling." Speaking of the Roads Corps, our contemporary says that "all went well so long as the experts were left alone, which was not for very long. Considerable dissatisfaction now exists at the action of certain officials of the War Office in superseding acknowledged professional authorities by jockeying into superior positions War Office soldier nominees. These officers are doubtless excellent military men, but they know nothing about roadmaking, and already the result of this jealous interference, and the placing of amateurs over experts, is said to be seriously retarding the enthusiasm of the local experts in securing the necessary recruits." This is certainly very disquieting, and it is to be hoped that some official statement, either by way of denial or explanation, may be vouchsafed.

* * *

A Building Contract Case.

A question of great interest concerning the construction of building contracts was raised in the case of *Hampton* v. *Glamorgan County Council*, which has now been finally decided by the House of Lords. The county council entered into a contract with a builder for the erection of some school buildings, and included in the contract were a number of provisional items. Among other matters, it was definitely contemplated that a low-pressure heating apparatus should be provided by a sub-contractor, and for this the sum of £450 was set aside. The builder, however, failed to pay the sub-contractor part of this sum, and the latter thereupon brought an action against the county council, claiming from them the balance due. In these circumstances the House of Lords held that upon the construction of the building contract the builder in employing a sub-contractor, or specialist, for the installation of the heating apparatus, up to a cost of £450, was acting as principal and not as agent of the building owners, and as no privity existed between the plaintiff and the defendants, the action had rightly been dismissed. It was also held by Lord Shaw of Dunfermline: There is no presumption under the law of contract that the effect of a clause containing provisional items is generally to make the building owner a real principal upon the contract under which such items are supplied. It is a question to be decided in every case by the language of the specific contract.

"London as it Ought to be."—With the Mayor of Stepney (Alderman H. T. A. Chidgey) in the chair, Mr. Davidge and Mr. Arthur Crow, of the London Society, on a recent evening at Toynbee Hall addressed the members of the Stepney Council on Public Welfare on the subject of "London as it Ought to be." Mr. Davidge (the *Morning Post* reports) urged the necessity of providing easier exits from London. Mr. Crow dealt largely with the question of arterial roads and their relation to slum dwellings. Unless, he said a properly ordered scheme of development, with adequate means of transport, were arranged the congestion in the East-end and in London over the Border would be intensified beyond conception. It was not intended that the whole of the suggestions of the London Society should be undertaken at once, but that the roads most urgently needed should be proceeded with. The Barking By-pass, approved by the authorities, should be carried out at the earliest possible moment, and the speaker suggested that this work might be undertaken by the Royal Engineers on the declaration of peace and before demobilisation.

The Main Drainage System of London.*

By GEORGE WILLIAM HUMPHREYS, M.Inst.C.E., Chief Engineer to the London County Council.

Two papers dealing with the main drainage system of London are to be found in the "Proceedings" of the Institution of Civil Engineers. Sir Joseph Bazalgette, in 1865, described the creation of intercepting sewers which had been constructed shortly before that date, and Messrs. Wouth & Crimp brought the subject up to date in 1897. The present position of the undertaking, at the end of 1916, is described in this communication.

London was originally drained by means of the old open tributaries of the Thames, examples of which are the Counters Creek, the Westbourne, the Kilbourne, the Fleet, the Walbrook, &c., and these tributaries, although covered in, perform the same function to-day. At a later stage cesspools were introduced. Following upon the introduction of the water-closet in 1810, the overflow from the cesspools into the sewers, at first prohibited, became permissive, and in 1847 became compulsory. Cesspools were then abolished, and the state of the Thames became offensive by reason of these streams discharging within the boundaries of the Metropolis. In 1855 and 1858 the Metropolis Management Acts were passed, whereby the Metropolitan Board of Works was constituted, and *inter alia* was charged with the duty of providing and controlling a set of main or arterial sewers to drain the Metropolis, a similar duty as regards local sewers being entrusted to local parishes or vestries. A system of large intercepting sewers, which ran from the West of London, was decided upon and constructed. They discharged into the Thames at points below the Metropolis, the outlet for the northern side of the Thames being placed at Barking, and that for the southern side at Crossness. The discharge was effected on an ebbing tide, the sewage in the tidal intervals over the period of high water being stored in reservoirs at the outfalls.

In 1884 a Royal Commission reported as to the state of affairs then existing, the discharge of crude sewage into the river at the new outfalls having been found to produce disagreeable effects, owing to the time taken for the discharge to reach open water, due to the daily tidal oscillations. In consequence of this report, works were undertaken to obtain precipitation of the sewage at the outfalls, the resulting sludge being taken out to sea and discharged in the vicinity of the Maplin Sands by means of specially-constructed vessels.

Since 1897, the date of the last communication to the institution, the London County Council, constituted in 1889, has carried out many

large and important works

for the improvement of the system and the amelioration of the drainage conditions over the large and populous areas now drained. During the first ten years of that body's existence many important works were undertaken, but in 1899 it adopted a scheme, based upon recommendations put forward by Sir Benjamin Baker and Sir Alexander Binnie, to enlarge the arterial system at an estimated expenditure of £2,750,000, and in 1903 it decided to expend, as a commencement to those works, another £751,000, on a scheme prepared by Sir Maurice Fitzmaurice for storm-water features, sewers and works. Upwards of £4,000,000 has been expended on this scheme up to date, the advent of the war having delayed completion of certain works. The old intercepting and outfall sewers, both on the north and on the south side of the river, have been practically duplicated and large provision has been made for the dealing with heavy rainfalls by the provision of storm-water sewers and pumping stations. Altogether about 87 miles of sewers, the greater length of which consists of large main lines, have been constructed by the London County Council.

Dependent as London is upon the tidal level in the Thames for its drainage discharge, the existence of a large area of 21 square miles in the heart of the Metropolis, the level of which is below very high water, and 19 square miles of which is below the level of an average high water, makes the storm-water drainage problem a difficult one to deal with completely. The authorities have recognised this by imposing restrictions on the erection of dwelling-houses on the low-lying area when certain conditions prevail. The author is of opinion that there is need for further legislation in order that the problem may be satisfactorily dealt with in the future, and that further provision will have to be made in the direction of providing additional storm-water outlets to the Thames, the provision made as regards intercepting sewers probably being sufficient for many years to come.

Several features of great interest presented themselves during the construction of the

new intercepting sewers.

The most marked was the comparatively small disturbance caused to the general community during the progress of the works, carried out as they were through the most populous parts of the Metropolis. A system of tunnelling was adopted wherever possible, and very long drives were made, reaching in one case up to 6,129 ft. Wherever sewers passed near to valuable properties, the tunnel was driven with a shield and cast-iron segments were inserted, lined on the inside with concrete and brickwork. This method of construction proved also very valuable where bad ground was encountered, the Thanet sands heavily charged with water being satisfactorily dealt with by these means. The highest class of workmanship has been insisted upon even in small details. Where, owing to the lapse of time, defects have developed in the old works, improvements have been effected, but the main features of the scheme laid down and initiated fifty years ago remain to-day in their original form, and have an equally long prospect of utility before them.

The population of the Administrative County of London at the last Census (1911) amounted to 4,500,000, in round figures. The London County Council has admitted to its drainage system the sewage from certain outlying areas, as, in fixing the county boundaries, considerations of watershed areas were not adhered to. In agreeing to drain these outside areas, the proviso has generally been made that only sewage to the extent of about 50 gallons per day per head of population on the area served is to be delivered and dealt with. Storm-water flow is therefore excluded. The system therefore dealt with an estimated population of 5,334,731 in 1911, and the indication given of change in these figures to the present date (1916) is that, as regards the county area, there is a slight diminution, while there is an increase in the out-county areas.

The total quantity of sewage computed to have reached the outfalls was about 200,000,000 gallons a day in 1894-95, and 280,000,000 gallons a day in 1914-15, an increase of 80,000,000 gallons per day over the discharge of twenty years ago. Compared with the past this is composed in part of rainfall that formerly was discharged by means of the old river-valley sewers and was not intercepted.

The effect of the elimination of the greater part of the suspended solids at the outfalls, and their conveyance to sea as sludge, when this operation was in working order in or about the year 1893, was immediate. The change in the condition of the foreshores and the river bed has been remarkable. The cost of

removal of the sludge to sea

during the past ten years was on the average, for working alone, 3·8d., or, including capital charges, 4·4d. per ton of sludge dealt with. The cost of precipitation over the same period has amounted, on an average, to £1 3s. 4d. per 1,000,000 gallons dealt with, including capital charges. The discharge of the sludge in the outer estuary of the Thames has been accomplished without any prejudicial results, and certainly by no other method could a like result, as regards low cost and immunity from nuisance or harm, have been attained. The London County Council has purchased about 750 acres of land in the neighbourhood of and surrounding its outfalls. This has the effect of isolating the outfall works, and at the same time the land would be available if later on future developments should demand the treatment by tried bacterial or other processes of either some portion of the effluent or the sludge.

The capital outlay on the system over the period

* Abstract of paper read before the Institution of Civil Engineers on Tuesday last.

1856 to March 31, 1914, amounted to about £12,500,000, of which approximately one-half has been repaid. The nett expenditure for maintenance for the year 1913-14 was £303,402, towards which out-county areas contributed £28,467. The rate charges for main drainage services (capital and maintenance charges) in the county area amounted to 3·355d. In addition to this, Londoners pay the local drainage rate, which, roughly speaking, is 1d. in the £ averaged over all the borough council areas.

HOUSING OF MUNITION WORKERS.

A COVENTRY SCHEME.

All (nearly 600) houses which were erected last year at Stoke Heath, Coventry, for munition workers are occupied, and the Ministry of Munitions has placed before the city council a scheme for building 200 dwellings on the south-east side of the city, off Park Side. The Minister is prepared to bear the cost, with the suggestion that the corporation should be willing to take over the properties after the war. The council (says the *Birmingham Post*) is recommended to accept the proposal, subject to their having the benefit of State aid as favourable as that which may be given to other schemes. In the Stoke Heath building the Ministry paid the difference between pre-war prices and those then existing.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

TRAMWAY CARS IN STREET CLEANSING WORK.

AN AMERICAN TOWN'S EXPERIMENT.

Tramway car street flushers have been in use in the cities of Worcester and Springfield, Mass., for over a year. Worcester was the first city in the United States to introduce street-car sprinklers, and in 1915 it was the first to introduce the new street-car flushers. Mr. A. T. Rhodes, Street Commissioner of Worcester, from whom the following data were obtained by *Engineering News*, states that these machines are operated throughout the entire season with great satisfaction—so much so that during last year the older methods of street cleaning were abandoned on all paved streets where there are electric tramway tracks.

The cars employed in the work contain a tank with a capacity of 2,900 gallons. The tanks are filled from subsurface hydrants placed between the tracks of the tramway system, and accessible by removing ordinary sewer manhole covers. The temporary connection is made by flexible leather pipes.

Street-flushing Tramway Car at Work.

The pressure for flushing is obtained by a centrifugal pump having a maximum capacity of from 500 to 600 gallons per minute, a speed of 2,600 revolutions per minute, giving a normal working pressure of 80 lb. per square inch. The pump is driven by a 45-h.p. electric motor. The pump discharge is equipped with a by-pass, enabling the operator to cut down the nozzle pressure to as low as 30 lb. per square inch. The operation of the car and flushing apparatus requires the services of three men.

On the wide streets there are five nozzles pointing in the direction the car is going, three on the car and two on the swinging arms. One of the three nozzles on the car, on a double-track street, catches the refuse lying on the paving between the two tracks, and throws it to the opposite track, then the return trip in the opposite direction catches the material and flushes it to the gutter.

Flushing Car using Sprinkling Apparatus.

Sprinkling within an hour ahead of the flushing has been found to be essential for the best results. For this purpose the older sprinkler type cars are economically used. The sprinkling softens up any deposits which are stuck down on the pavement, and makes it easy to remove them with the flusher. The new flusher cars have the original sprinkling attachments, both on the car and on the swinging arm, so that the same car can be used for both sprinkling and completing the work with the flushing nozzles, if so desired. With preliminary sprinkling

a car flusher will cover about 10½ miles of street per night. The average eight hours' work for a car doing both sprinkling and flushing is about 9 miles of street, varying from 25 ft. to 75 ft. between kerbs. During eight hours' use the car flusher distributes approximately 95,700 gallons of water. One tank of water is sufficient to sprinkle a street 38 ft. to 45 ft. wide between kerbs a distance of about 1 mile. The same tank of water will properly flush between one-quarter and one-third of a mile.

Previous to the adoption by the city of the method of flushing at night, the streets were sprinkled by trolley cars during the day. Under the day sprinkling system the water simply laid the dust, and the other refuse which had accumulated upon the street surface remained, forming a greasy, slippery scum, extremely dangerous to vehicular traffic. Night flushing has made it possible to discontinue sprinkling during the day.

When the day sprinkling was in operation three car sprinklers, making several journeys over each street every day, covered the same area now covered by two flushers, making one round trip nightly, for sprinkling and flushing combined. The flushers work eight hours, and the sprinklers under the old method worked 14 hours per day. The amount of water used under the flushing system is about 60 per cent of that used under the old style sprinkling, while the present combined sprinkling and flushing requires about 85 per cent of the former amount.

Previous to the installation of this system two machine broom gangs were worked at night, covering these paved streets from two to three times per week. This work cost £2,800 yearly, and was not very satisfactory. Moreover, it was difficult to keep track of the labour during the night hours. This has been discontinued entirely; the only cleaning necessary is done by pushcart men, the first thing in the morning. They clean up the gutters, and owing to the fact that the streets are absolutely clean when they reach them, their labours have not been increased, nor is there any additional expense incurred.

THE CULTIVATION OF ROADSIDE WASTES.

LANCHESTER COUNCIL "WINKS AT" THE PROPOSAL.

At a meeting recently of the Lanchester Rural District Council, Councillor Lubbock introduced the question of the cultivation of land by the roadside. He did not know, he said, whether permission for this could be given by the council. If so, he suggested that applicants should give their names to the surveyor under whose control the necessary arrangements could be made. He thought it must be recognised that they could not all keep pigs, but everybody could do something to utilise spare ground and help to produce food. From his knowledge of Lanchester there would be a lot of applications. There were twenty-three from the bottom part of Lanchester who applied, but they could not be accommodated by the council, owing to the enormous price asked for land.

Councillor Lowdon: Is this not a question for the parish council?

Councillor Davis: Not the roadsides. If Mr. Lubbock puts his suggestion as a motion I will second it.

The chairman (Councillor W. Robinson) said he had received applications from No. 1 for permission to cultivate the waste ground by the roadside opposite the Rectory there. He told them they would have to apply there names to the surveyor.

Councillor Lubbock said he knew some gentlemen in Lanchester who were anxious to get land within reasonable distance of their houses. The surveyor might then consult and report. He moved his resolution.

Councillor R. Davis seconded.

Councillor Ripley inquired if the council would protect the parties who cultivated the land by the roadside or have any responsibility in the matter?

The chairman: No responsibility whatever.

The clerk: The council cannot give permission but you might wink at it. Still, it does not give the cultivators who occupy that whatever fences they put up, the Dog, Dick or Harry may knock them down. Roadsides are public and must remain public.

Councillor Lubbock: Our surveyor could make that known when applications are received and tell them they take the whole responsibility. Most of the allotments know it already.

After further discussion the motion was agreed to.

ELECTRIC VEHICLES FOR BRIGHTON MUNICIPAL WORK.

The Works Committee of the Brighton Corporation reported recently that they have had under observation the progress which is being made in various towns in the substitution of motor traction for horse traction for street watering, scavenging, and house refuse removal. In June, 1915, they had on loan for a week from the manufacturers a motor dust van, which was operated with successful results; but the adoption of motor traction for house refuse removal purposes is not at present recommended.

The existing horse hire contract expires in June, 1917, and it is not expected that a further contract can be entered into in the same quarter.

As the result of their visit to various towns, the chairman of the committee (Alderman Pankhurst) and the borough surveyor (Mr. H. Tillstone) recommended that a 3½-ton electric motor vehicle and a 5-ton steam vehicle be purchased, each vehicle to have interchangeable bodies and to be used for watering and general haulage; they could also be used for ash collecting in certain places where arrangements would be made for quick loading.

The estimated cost of the two vehicles per annum is as follows:—

Five-ton Steam Vehicle.—Cost of purchase, £830; interest, depreciation, maintenance, wages, &c., £362 17s. 6d.; cost per day, £1 3s. 8d. 3½-ton Electric Vehicle.—Cost of purchase, £995; interest, depreciation, maintenance, electricity, wages, &c., £423 11s. 3d.; cost per day, £1 7s. 7d.

The present cost for horse and driver per day is 11s. 4½d. It is estimated that these two vehicles will do the work of six horse vehicles. The cost of the vehicles will be £2,050, including the watering tanks (£225), and as £400 has been received from the War Office for the steam roller taken over by the Road Board, the chairman and the borough surveyor recommended that this amount be used for this purpose, and that the balance be provided out of the amount estimated to be unspent (about £3,000) in the estimate for 1916-17 for highways, scavenging, street watering, and ash collecting.

The committee recommended that these two vehicles be purchased, which the town council agreed to. It was stated that the committee looked forward ultimately to substituting motor vehicles for horse vehicles for all purposes except that of house refuse collection, for which, at present, horse vehicles are more economical.

ELECTING A BOROUGH SURVEYOR.

HOW IT IS DONE IN IRELAND.

There was an extraordinary scene at the election of a borough surveyor for Ennis at the meeting of the urban council there on the 1st inst. At the hour fixed for the meeting, the *Irish Times* reports, it was found that the town hall door had been locked, and members of the council outside demanded admittance. Meanwhile a big crowd and a band had collected outside. One of the two candidates for the vacant office was among those who were locked out. The police were summoned, and when a body of constables arrived they tried in vain to get the doors opened. The chairman endeavoured to have the members who were outside admitted, but failed, and there were scenes in the hall, where heated interchanges took place. Then the chairman left the chair, and declared the meeting adjourned. Another member was immediately moved to the chair, and Mr. F. Tierney was declared elected as borough surveyor. Afterwards one of the members of the council was badly assaulted on his way home.

Edinburgh Refuse Collection and National Service.—The Cleaning and Lighting Committee of Edinburgh Town Council recently considered the probable effect upon their staff of the new national service organisation. Already the staff has been considerably depleted, and it is anticipated that more women will have to be enrolled in the city's service, although most of the work suitable for women is already being done by them. The committee point out that the public might help by burning more of the rubbish and refuse than they do at present, with the twofold advantage of saving fuel and lightening the load of collection.

Principles Involved in Computing the Depreciation of Plant.*

By F. GILL and W. W. COOK, MM.I.E.E.

(Conclusion.)

The engineer controlling a system must be able not only to know the annual charges on each kind of plant, but also to estimate the value remaining in the plant at any time.

In considering extensions of plant, or the adoption of improved plant, it frequently happens that the question arises whether it is economical to take out certain plant still performing satisfactorily the service it is adapted to, and replace it by new plant of a more economical nature. If the existing plant is taken out there will be a wastage of its then value in place, plus the cost of taking it out and less the amount received for the recovered materials, the nett result of this being a present loss when the change is made.

Against this loss there is to be set any economy in annual charges that may be gained by the new plant during the period which would have remained of the displaced plant's life. Further, since the wastage must be incurred when the change is made, while the prospective savings are in the future, the two sums must be brought to a common time for comparison; in fact, the problem is to find out if it is worth while to incur a present loss to achieve a future gain.

Unless the new plant will thus pay for the wastage, or unless there are compelling reasons which require the change irrespective of economy, the change should not be made.

The solution largely depends upon what is the value of the plant in place, still performing its service satisfactorily and capable of continuing to do so for some time longer, and the engineer must be able to estimate this value by some logical process.

If the first cost and the annual charges have been rightly estimated, the diminution in value is the amount which should be in the renewals fund, for that was the very purpose of the fund—that is, the first cost less the amount which should be in the fund is the measure of the remaining value—or, it may be stated, that the remaining value in the plant, plus the amount which should be in the renewals fund, is always equal to the first cost.

One easy way to test the equity of the value in place produced by the alternative methods used in treating depreciation is to examine how each would result if an undertaking passed successively to several owners, on the basis of the remaining value being the first cost less the amount which should be in the renewals fund.

In this case, as already shown, the life concerned is not the economic life, but the physical life, so that in calculating the following tables we must take the physical life of twenty-five years and the residual value, at the end of life, of £2.

Assume an original owner whose conditions are set out in Table 2 (5 per cent sinking fund), to whom the user of the plant pays £7·05 per annum, sells at the end of the eighth year on the basis of this table. He will then sell for £100 less £19·61 (the amount in the fund) = £80·39.

This second owner's conditions will then be: Capital £80·39, remaining life 17 years, residual value £2, other conditions as before, and the table shows these figures for the next eight years.

If the second owner transfers to a third owner at the end of the sixteenth year, on the same basis, he will then sell for £80·39 less £28·97 = £51·42.

The third owner's conditions will then be: Capital £51·42, remaining life nine years, residual value £2, other conditions as before, and the financial result is shown in the table.

If the third owner transfers to a fourth at the end of the twenty-fourth year, on the same basis, he will sell for £51·42 less £42·8 = £8·62.

This last owner's conditions will then be: Capital £8·62, remaining life one year, residual value £2, other conditions as before, and the table shows his position.

This last owner finds £2 from sale of materials, and £6·62 from his renewals fund, and thus gets back the money he had invested.

It is true that the portion of the annual charge allocated in this example to renewals becomes larger each year, being for the case under consideration £2·05, £3·03, £4·48, and £6·62; but that is only one part of the transaction, and the increase is exactly counterbalanced by the reduction of the charge in respect of return on capital, in this case £5, £4·02, £2·57, and £0·43. It will be observed that each successive owner has taken over the plant at what it would have stood at had part of the capital been paid back each year on the annuity method.

Thus each successive owner has had the same plant, the same annual charge, and has got back all his capital at the end of his term.

Of course, if the renewals fund is not credited with the same rate of interest as the return on capital, the strict equality will not hold good; but the only reason for accepting a less rate than the plant earns is to obtain a greater security for the fund than for the main investment, and this course is based on prudence rather than on equity.

Now contrast what happens under the straight line law, the annual rental remaining constant at the amount fixed by the first year's annual charge. The figures used are shown in Table 3.

The first owner's conditions are: First cost £100, life

TABLE 2.—VALUE OF PLANT IN PLACE: SINKING FUND METHOD.
First Cost = £100. Residual Value = £2. Physical Life = 25 years.
Return on Capital 5 per cent per annum.

A		B	C	D	E	G	H	L
End of year.		Capital.	Return on capital 5 per cent per annum.	Renewals fund.	Total C + D	Total in renewals fund.	Value of plant in place, B − G	Per cent return on capital.
In different ownerships.	In plant's life.							
First owner		£	£	£	£	£	£	
1	1	100·00	5·00	2·05	7·05	2·05	97·95	5
8	8	100·00	5·00	2·05	7·05	19·61	80·39	5
Second owner								
1	9	80·39	4·02	3·03	7·05	3·03	77·36	5
8	16	80·39	4·02	3·03	7·05	28·97	51·42	5
Third owner								
1	17	51·42	2·57	4·48	7·05	4·48	46·94	5
8	24	51·42	2·57	4·48	7·05	12·80	8·62	5
Fourth owner								
1	25	8·62	0·43	6·62	7·05	6·62	2·00	5

* From a paper read at a meeting of the Institution of Electrical Engineers on January 11th.

twenty-five years, residual value £2. He charges the plant with £8·92 per annum, and has the plant for eight years. During that time the money he receives, together with the interest earned by the renewals fund, which is not credited to its source—*i.e.*, the plant account—is sufficient to enable him to pay a return on his capital increasing from 5 to 6·37 per cent.

He then sells on the basis of this table at £100, less £31·36 = £68·64 and this, with what is in his renewals fund, his capital is repaid.

The second owner's conditions are: First cost £68·64, residual value £2, remaining life seventeen years, and the table shows the figures for the next eight years.

Here it is seen that the annual charges for the second owner, consisting of the return, column C, plus the renewals column D, fall short of the total for the original owner by £1·57, and this is available with the interest earned by the fund to give a total return on the capital increasing from 7·28 per cent per annum in the ninth year to £9·28 per cent per annum in the sixteenth year.

If the second owner transfers to a third at the end of the sixteenth year, he will sell for £37·28 (£68·64 – £31·36), and the conditions for this owner will be: First cost £37·28, residual value £2, remaining life nine years, and the result is shown in the table.

The balance here, column E, is greater than before, and therefore the figures should be, if interest be not added to the fund—

	Amount. £	Life in years.	£ × years.
Class A	300	10	3,000
,, B	200	5	1,000
,, C	100	2	200
	600		4,200

$$\text{Total average life} = \frac{4{,}200}{600} = 7 \text{ years.}$$

But in this calculation, £300 for Class A, £200 for Class B, and £100 for Class C were employed, whereas in the complete cycle of ten years the money actually involved will be:—

	£	£
Class A, one renewal	= 300 × 1	= 300
,, B, two renewals	= 200 × 2	= 400
,, C, five renewals	= 100 × 5	= 500
		1,200

TABLE 3.—VALUE OF PLANT IN PLACE: STRAIGHT-LINE METHOD.
First Cost = £100. Residual Value = £2. Physical Life = 25 years.
Return on Capital 5 per cent per annum.

A		B	C	D	E	F	G	H	J	K	L	M
End of year.		Capital.	Return on capital 5 per cent per ann.	Renewals fund.	Total C + D	Balance to equalise first owner's annual charge of £8·92 per ann	Total in renewals fund.	Value of plant in place B – G	Interest on fund.	Total return C + F + J	Per cent return on capital.	Average per cent return on capital.
In different ownerships.	In plant's life.											
First owner		£	£	£	£	£	£	£	£	£		
1	1	100·00	5·00	3·92	8·92	—	3·92	96·08	—	5·00	5·00	
8	8	100·00	5·00	3·92	8·92	—	31·36	68·64	1·37	6·37	6·37	—
Second owner												
1	9	68·64	3·43	3·92	7·35	1·57	3·92	64·72	—	5·00	7·28	—
8	16	68·64	3·43	3·92	7·35	1·57	31·36	37·28	1·37	6·37	9·28	—
Third owner												
1	17	37·28	1·86	3·92	5·78	3·14	3·92	33·36	—	5·00	13·41	—
8	24	37·28	1·86	3·92	5·78	3·14	31·36	5·92	1·37	6·37	17·09	—
Fourth owner												
1	25	5·92	0·30	3·92	4·22	4·70	3·92	2·00	—	5·00	84·46	84·46

and the total return on the capital increases from 13·41 per cent to 17·09 per cent per annum.

If the third owner transfers to a fourth at the end of the twenty-fourth year, he will sell for £5·92 (= £37·28 – £31·36), and the last owner's conditions will be: First cost £5·92, residual value £2, remaining life one year, and his position is shown in the table.

The last owner gets £2 for the residual value, which with £3·92 in the renewals fund repays his capital, and the total return on his capital is 84·64 per cent per annum.

Thus each successive owner has had the same plant, and has got back all the capital invested, but each successive owner has received a higher percentage return on the capital invested than any of the previous owners.

It may be argued that the amount of profit an owner can make has nothing to do with the value of the plant, and this is true. In the above cases the relative profits under the same conditions have merely been used to test whether the price at which the plant is valued comes out right or not.

When one finds that, on one hand, when interest is brought into the transaction there is absolute equality as between various years or various owners, and on the other hand when interest is not brought in, the successive year or successive owner is always progressively favoured, one has good ground for the conclusion that all is not right with the method of valuation which includes interest on the renewals fund payments.

EQUATED LIVES FOR COMPLEX PLANT.

In treating a case in which there are various lives, it does not appear to be well known that the average life obtained is the usual manner of getting a weighted average is an erroneous figure to use in calculations for redemption of money.

If we take a plant consisting of three classes of articles, having different first costs and lives, as shown below, we find that the average life is seven years, obtained as follows:—

	Amount. £	Life in years.	£ × years.
Class A	300	10	3,000
,, B	400	5	2,000
,, C	500	2	1,000
	1,200		6,000

$$\text{Equated life} = \frac{6{,}000}{1{,}200} = 5 \text{ years.}$$

One usual way of calculating this equated life—*i.e.*, without interest, is to divide the first cost by the sum of the annual instalments. If, on the other hand, interest (say 5 per cent per annum) is added to the renewals fund, the calculation will be 4·95 years as the equated life. If an average life of seven years is taken for calculating the provision, the actual deficit will be £1,200 – £857 = £343 in the ten years.

It will be seen that there is a great danger if the difference between average and equated lives is not appreciated. For a complex plant, use of the average life will result in inadequate provision, because the equated life is always shorter than the average life. Provision for a complex plant can only be made either by providing separately for each part and summating the annual payments, or by using the correct equated life and treating the plant as a whole. When, however, a subdivision of plant having the same general characteristics is considered, the average lives or ages may safely be used.

WHERE LIFE IS LIMITED BY UNITS OF WORK PERFORMED RATHER THAN BY TIME.

In some cases the life of plant is limited by the units of work performed rather than by time. One

example of this is a tool such as a lathe or press; another is a locomotive. Such things do not wear out by the passage of time, but by the work which is done by them, and it would be wrong to estimate the life of such a thing merely in years irrespective of work.

The question arises how the proper charge per unit of work is to be arrived at, since in some cases there must be found the correct amount to be charged to each job for the use of a tool or machine.

In such a case time—*i.e.*, the physical and economic lives—must be brought into the calculation, and one is bound to estimate a period during which the units of work will be performed in order not to ignore the fact that the payment for depreciation is made in advance of the money being actually required, and therefore interest must accrue.

CONSTANT MAINTENANCE COST.

It has been assumed that the maintenance cost would be constant throughout the life of the plant, and it is necessary to return to this question.

The renewal of each part, as it is required in its turn, is provided for by the fund established on the basis of the equated physical life. An equated life arranged for all the plant provides money for the renewal of every part. The cost of maintenance is the cost of looking after the plant, keeping it in running order, repairs, keeping records and inspections, but not of making renewals. It seems clear from this reasoning that there is not much room for increasing maintenance cost.

Sometimes in practice it is found more convenient to charge small renewals to maintenance rather than to renewals account, but that convenience does not affect the question of fact.

We believe that constant maintenance cost, if full provision is made for renewals, is a tenable assumption.

Some advocates of the straight line method say that the interest on the depreciation fund is required to offset an alleged increasing charge. If there are cases of maintenance cost increasing with age, this increasing cost must, of course, be met, and any such cases will doubtless have well determined cost data, but the provision should be made directly and not indirectly. It would be curious indeed if on all classes of plant the increasing cost of maintenance were just the amount provided by interest at varying rates, compounded over various periods.

ASSESSMENT OF PROFITS.

The amount to be charged to depreciation, or as we prefer to put it, to renewals fund and to improvements fund, before assessing the profits of an undertaking, is the total amount indicated by the portion of the annual charges allotted to those costs. The correctness of the annual charges has already been discussed, and when these have been settled, then the charge against the year's income for renewals and improvements must follow in principle that settlement, subject to any alteration of fact which later knowledge may have brought to light. But this does not permit of any change in the method.

If the sinking fund method is correct for the annual charges, it must also be correct for the year's accounts; otherwise the annual charges are not true, and if they are not true, the primary object of ascertaining the annual charges—to select plant wisely—is vitiated.

The accountant cannot logically at this stage question the correctness of the charge; he may honour the bill or not, may put away more or less than the correct sum as given by the annual charges, but this sum remains the true measure of the year's debit against the undertaking.

The accountant has a duty laid upon him to insist on his share of the responsibility in providing for depreciation, but he must take up the question at the proper place—that is, in consideration of the depreciation component of the annual charges.

IF DEPRECIATION RESERVES ARE INVESTED IN THE BUSINESS.

Up to the present one assumption has been that the capital account was closed, and therefore the reserve funds could only be lent outside. But for many purposes it is more convenient to invest these reserves in the business itself rather than to lend them outside and raise fresh capital for the extension of the business. There is no difference in principle whether the reserve be lent outside or invested in the business; in either case the money must earn interest and the interest must be credited to its real source.

CONCLUSIONS.

There is only one common method for the financier, the accountant, and the engineer.

This common method is best studied in the annual charges for plant, determined in advance of construction.

To determine the amount in the annual charges for depreciation it is necessary to estimate the first cost, residual values, and the physical and economic lives of the various classes of plant.

It is also necessary to fix the treatment of the capital account and to estimate the charge for return on capital.

The interest to be earned by the reserve funds must be credited to its source.

The reserves are preferably handled by means of two funds, as follows:—

(*a*) A renewals fund for providing the necessary money at the end of the physical life—that is, the end of the period during which the plant will give its service satisfactorily under all conditions *outside* the owner's control.

(*b*) An improvements fund for providing sufficient additional money to enable the plant to be taken out of commission for reasons *within* the owner's control, and while it is still giving its service satisfactorily.

The calculation of the amounts to be contributed to these two funds must include the interest which should be earned by the money before it is required at the end of the life.

The amount, calculated as above, which should be in the renewals fund gives the correct diminution in value, when considering the value to the owner, of the plant in place and working, at any period in its history.

The amounts, calculated as above, which should annually be put to the two funds, renewals and improvements, determine the correct depreciation charge against the undertaking for the purpose of assessing profits, fixing rates, and, under certain conditions, assessing the value of an undertaking as a going concern.

The sinking fund method fulfils all the requirements.

The straight line method does not.

All estimates, such as first cost, physical and economic lives, and interest earned by funds, will require revision from time to time, either as a result of experience or of changes in conditions.

LOCAL AUTHORITIES AND FURNITURE STORAGE.

BIRMINGHAM COMMITTEE'S REPORT.

On the subject of the storage of the furniture of married Army recruits, the Estates Committee of the Birmingham Corporation report that they have considered the matter, and have also had the opportunity of inspecting two of the most recently-erected and up-to-date storage warehouses in the city. They state there can be no doubt that the business of storing furniture, entailing as it does vehicles and power for the removal from the house to the warehouse, with the packing and storage of such furniture in properly ventilated and heated store-rooms, requires a considerable capital and a staff trained and experienced in the work, which, if properly and systematically carried out, is of quite a complex nature. They have had an interview with representatives of the local Warehousemen and Furniture Removers' Association, who pointed out that only six removers and storers were carrying on business in Birmingham now owing to the poor financial return, and that there was still accommodation in suitable warehouses for about sixty van-loads of furniture. In the event of more accommodation being necessary the association pledged themselves to provide it in suitable buildings. The association were prepared to give an undertaking privately to the committee that storage accommodation would be provided at a rate which was agreed, and of course in addition to this there would be the usual charge for removal and the rate would not cover insurance.

The committee are of opinion there is or will be provided ample accommodation for the storage of furniture, that the charge proposed is reasonable, and that it would be unwise for the council to undertake the work.

Trade Wastes.—"Some Improvements in Dealing with Trade Wastes" is the title of a paper which Mr. R. D. West will read at a meeting of the Junior Institution of Engineers to be held on Monday, the 19th inst., at 7.30 p.m.

Correspondence.

Ἐκ διὸς οὐ πάντ' ὀπᾷ

(One man does not see everything.)—Euripides.

SEWAGE PUMPING: CENTRIFUGAL PUMPS v. PNEUMATIC EJECTORS.

To the Editor of The Surveyor.

Sir,—Messrs. Daniel Adamson's letter in your issue of February 2nd, under above heading, is interesting. As makers of the "Ratean" centrifugal pump their remarks must carry considerable weight.

There is a certain amount of irony in their use of these arguments, which first appeared in an article written by Mr. H. C. H. Shenton some ten years ago.

(1) One of the objections to pneumatic ejectors was leakage in air mains, but with Messrs. Stewart's and Lloyd's lap-welded steel protected pipes with electrically welded joints bottle-tight air mains can be obtained. Then as Professor Unwin has shown that thermal loss is given back in increased volume due to rise in temperature, pneumatic transmission is more economical than electrical.

(2) Another source of loss is leakage of air past delivery valve, but though this is a mechanical loss it is a sanitary gain, as it stops septic action in the sewage, and with latest developments in intensified aëration it means an eventual gain in treatment.

(3) Ejector chambers can be made more cheaply than subterranean chambers for electrically-driven pumps, and an ejector is less costly than a centrifugal plus motor, plus the costly electrical switch necessary. Thus, if power has to be put down, a pneumatic installation is cheaper than an electrical one.

(4) I have in several instances put forward ejector schemes in competition with electrically-driven centrifugal schemes, and in each instance the central pneumatic power plant has been of less horse-power than the aggregate power of the electric motors for driving the centrifugal pumps.

(5) My firm have lately taken out some electrically-driven centrifugal pumps and replaced them with pneumatic ejectors, using the existing motors to drive compressors for operating the ejectors, and the result is an actual saving in electrical units per week.

Yours, &c.,

J. H. Coombs.
of Messrs. Jones and Attwood, Stourbridge.
Makers of the "JandA" Ejectors.

February 3rd, 1917.

THE CIVIC SURVEY OF SOUTH-EAST LANCASHIRE.

To the Editor of The Surveyor.

Sir,—May I trespass on your space to venture to suggest that you have been guilty of a slight injustice in your otherwise valuable summary of town planning contained in the issue for January 26th? Your paper is so remarkable for a sane and judicious outlook that I am sure you will forgive me pointing out a lapse from this attitude.

In your description of the work of the civic survey of Manchester you dismiss it in half a sentence by remarking that the plans "unfortunately showed the lack of practical experience which is so often associated with fine artistic qualities." I think that a little closer study of the work would correct this view.

At the meeting of the North-Western District of the Institution of Municipal and County Engineers which you refer to in your article it is true that as might have been expected there was a good deal of criticism on the methods, but I think I may say that this criticism was practically met. The principal exhibit, it will be remembered, was the road traffic plan, and the chief criticism levelled against it was that the traffic counts were taken per one hour, instead of for twenty-four hours. Of course the obvious reply to this would be that attempts to take one year of the work of the staff to obtain the traffic count of one hour each day would take that year on the basis of twelve hours. But a more crushing reply than this rough-and-ready one was made when it was pointed out that the object of the plan was to obtain a *record bird's-eye view* of the traffic conditions in the whole of this south-eastern area of Lancashire. The comparisons made by individual engineers invariably referred to counts in their own districts, which they were concerned with in particular roads or groups of roads, and where they wanted most exact knowledge concerning the variation of the seasons, different days in the week, and different hours in the day. For a general small-scale plan, however, one which corresponds to the eighth-scale drawings of a building, a one-hour's count was just as good as twelve. It was the comparative volume that was required. It was also stated that, to save investigation time on the part of the workers on the civic survey, the help and co-operation was enlisted of the municipal and urban district surveyors and of the police. They were asked to indicate what was the most crowded hour of the most crowded day of the week, and we trusted to their local knowledge to give us a correct answer. It is interesting to know that in most cases both these authorities coincided; where they did not, separate hour counts were taken for comparison.

It will thus be seen that these one-hour counts had behind them the experience of all those local people who were familiar with local conditions, and the resulting plan gives a very accurate picture of the general trend of the main traffic routes and their comparative volume. It was not, of course, suggested that any one count might be made use of as the basis for a detailed road widening. It would have to be supplemented for such purposes by more detailed countings. That this plan was not wholly impractical is proved by the fact that on the suggestion of an engineer to a county borough it has been taken as a basis upon which to discuss the main road proposals that are being prepared by all the local authorities in the area. These proposals are being assembled on a plan, and will form the basis of a discussion on lines similar to those which have produced such good results in Greater London.

I am sure that if the writer of your summary could find time to pay a visit to the rooms of the Manchester Society of Architects, Mr. Percy Lodge, F.R.I.B.A., or any of the other gentlemen who are working on the civic survey, would be only too pleased to show him that the other branches of the work are of equal practicalness with the traffic plan, and because they happen to be well drawn and nicely coloured they are none the less useful. You will agree it is rather disheartening to architects and surveyors who have been giving this work their serious attention for many months to have it dismissed in a phrase as though of no practical utility.—Yours, &c.,

Patrick Abercrombie.
Hon. Director to the Civic Survey of South Lancashire.

Liverpool.
February 2, 1917.

TESTING FACILITIES IN IRELAND.

To the Editor of The Surveyor.

Sir,—Our attention has just been directed to "Notes from Ireland" in your issue of December 29th last, in which your correspondent points out the need of an establishment for testing cement and similar constructive materials in that country, and, further, goes on to suggest that such work might be taken up by the universities or principal technical schools for a small fee.

In the first place, might we point out that we have been established in Westminster for that very purpose for some thirty years past, and in the ordinary course of practice are constantly receiving samples of cement and similar constructive materials from public bodies and others in Ireland for analysis, test and report; as regards any objection that might be raised as to distance we presume that, in normal times, a sample takes no longer to reach London from Ireland than, say, from Limerick to Dublin, or wherever the testing establishment proposed by your correspondent might be situated.

Secondly, with regard to the suggestion that such work should be taken up by the universities or technical schools for a small fee, we cannot protest too strongly against such a course; it is obviously grossly unjust that an endowed or State-aided institution should be allowed to undertake such work at unremunerative rates, and thus compete unfairly with private establishments, which, though specially organised and equipped, have not the

public purse to draw upon to meet their expenses.—Yours, &c.,

HENRY FAIJA & Co.
(D. B. BUTLER).

6, Earl-street, Westminster, S.W.,
Feb. 6, 1917.

DECIMAL WEIGHTS, MEASURES, AND COINAGE.

To the Editor of THE SURVEYOR.

SIR,—As an advocate of change I am prepared for ordinary criticism, but Mr. Phillips's letter (in your issue of 2nd inst.) brings in "psychical" weapons that are beyond me, so I decide to refrain from argument, as being unsuitable when his claim for inspiration (even by accident) is to be considered. I must become a believer or remain in outer darkness. Let me become a true believer, and seek comfort from the prophet's words, and I find it thus:—

(*a*) "We (the British) have mixed these natural scales and produced the distracting jumble" (line 37).

(*b*) "As complete and perfect as the French system" (line 43).

(*c*) "As perfect as the metric system" (line 52).

And thus I am confirmed in my original faith by the prophet's words, and I begin to wonder whether it were better to evolve a new and perfect system—using psychic and all other forces to attain that end—or to tolerate the few imperfections of the metric system, and take advantage of the fact that:—

(1) It has been in practical use during seventy years.

(2) It has become supreme in science work.

(3) It has almost displaced all other weights and measures throughout half the civilised world.

(4) Its construction, on a basis of ten, as used in our system of counting, makes it convenient for calculations of every description and for the use of arithmetical machinery and labour-saving devices.

I trust that your readers will decide with me that these four advantages will outweigh any little imperfections, and will join the growing metric host.—Yours truly, &c.,

EDWARD C. BARTON.

February 5th, 1917.

BUILDING MATERIALS AND FUEL ECONOMY.

To the Editor of THE SURVEYOR.

SIR,—I am engaged on behalf of the Committee on Fuel Economy of the British Association in making investigations on the consumption of fuel for domestic heating and other purposes, with a view to economising the national resources. One branch of this investigation has as its object to determine forms of building construction which will reduce the loss of heat through the walls of a dwelling house. In this connection I am endeavouring to compare the heat-retaining effect of different kinds of plaster applied to the inner surfaces of walls.

There must be many inexpensive compositions known to some of your readers, which will probably produce a great effect in this direction. I write, therefore, to ask any such persons who are interested in this most important national problem, and who are in a position to submit suitable samples, to communicate with me at the University College.

We have erected in the laboratories here an apparatus capable of making tests of the exact effect of such plaster, and I should be prepared to submit any samples sent to me to that test if it appeared to offer any prospect of success.

May I request you, therefore, to ask any of your readers to give us their assistance in this nationally important matter?—Yours, &c.,

A. H. BARKER.

Department of Heating and Ventilating Engineering, University College, London.

February 2nd, 1917.

SIZES OF SEWERS.

To the Editor of THE SURVEYOR.

SIR,—The note under the above heading in your "Scottish Notes" column of January 26th is of interest, and in answer to the writer's appeal for further information I have pleasure in stating that my experience regarding 6-in. pipe sewers corresponds with that of your correspondent. In connection with the first development at Rosyth—within the city of Dunfermline—a similar proposal was made and was rejected for similar reasons.—Yours, &c.,

P. C. SMITH.

Dunfermline. Burgh Engineer.

February 3, 1917.

IRONIES OF NATIONAL SERVICE.

A SURVEYOR'S VAIN SEARCH.

Mr. Donald Maclean, M.P., chairman of London Appeal Tribunal, on Monday, criticised the methods of Government departments, who, one after the other, had declined to avail themselves of the services of a qualified surveyor, passed B 2, who wished to render national service.

"At the suggestion of the Tribunal," said the surveyor, "I made efforts to obtain substitution work suitable to my gifts and training. After applying in vain to one Government department after another I went to the Hotel Cecil, where, having met a private and sergeant, I was referred to an officer, who told me that if 300 jobs were open as many as 3,000 applications were usually received."

Mr. Maclean: Here is a gentleman highly qualified and quite unfit for active military service. He goes from one Government office to another with recommendations and the desire to serve his country in the best way he can by placing his trained intellect and business capacity at the national service. He goes from one hotel or ducal mansion to another, and he is received by privates and sergeants and sergeant-majors, and is passed on and on and on. The result is he comes back with nothing done, and the suggestion to us is that we shall put him into khaki.

Lieutenant Watson: Oh, no; my suggestion is that you should give him another short adjournment to enable him to apply to replace a fit man at the Office of Works.

The Chairman: The real fact of the matter is that heads of departments do not want to be bothered more than they can help, but if they have men fit for service they hold on to them. What is the good of talking about vast schemes of national service when we see here a little bit of the machinery at work? What they want is not vast new establishments, but some common sense, and that they want very badly.

In granting a month's adjournment, Mr. Maclean added: "We will give Government departments another opportunity to utilise a really useful man."

SURVEYORS' INSTITUTION.

PRELIMINARY EXAMINATION, 1917.

The following candidates have satisfied the examiners in the above:—

Messrs. L. G. Alldridge, Birmingham; S. N. Bax, Wincanton; E. E. Beard, Colchester; S. J. Bickford, Burnley; L. Brailey, Plymouth; G. C. Crowley, Stockbridge, Hants; T. G. Daniels, Liverpool; G. Grange, Pateley Bridge; A. T. Greenslade, Pomphlete, near Plymouth; J. W. Hanstock, Upper Batley, Yorks; J. H. Harris, Alverstoke, Hants; L. M. Helmore, Exeter; W. A. Hill, E. Dulwich, S.E. (head of list); E. C. Horne, Hounslow; A. R. Jarman, Hemel Hempstead; R. E. Johnson, Uxbridge; D. E. J. Knapp, Corsham, Wilts; F. B. Marsh, Stroud Green, N.; H. M. Matthews, Lincoln's Inn, W.C.; F. W. Pexton, Scarborough; H. A. M. Prall, Rochester; B. Radclyffe, St. Briavels, S.O., Glos.; D. W. Rees, Penybank, Ammanford, S. Wales; G. E. Turner, Birmingham; E. D. Vinson, Loose, near Maidstone; H. Ward, Bere Alston, Devon.

Damp Cellars.—In these days of street economy a surprisingly large amount of waste results from food stuffs and other materials being stored in damp cellars. The difficulty is easily overcome by the use of a waterproof cement rendering. In the case of the cellars of a mansion at Roehampton, which were very damp, this treatment was successfully applied, the powder "Pudlo" being adopted for the work.

Road Improvement in Birmingham.—A joint conference of the Public Works, Tramways, and Town Planning Committees of the Birmingham City Council was held last week for the purpose of considering the construction of ring and the improvement of arterial main roads and other questions in which the two are severally interested. At the close of a long meeting (says the *Birmingham Post*) it was reported that no definite decision had been come to, and the conference was adjourned to a date to be fixed later.

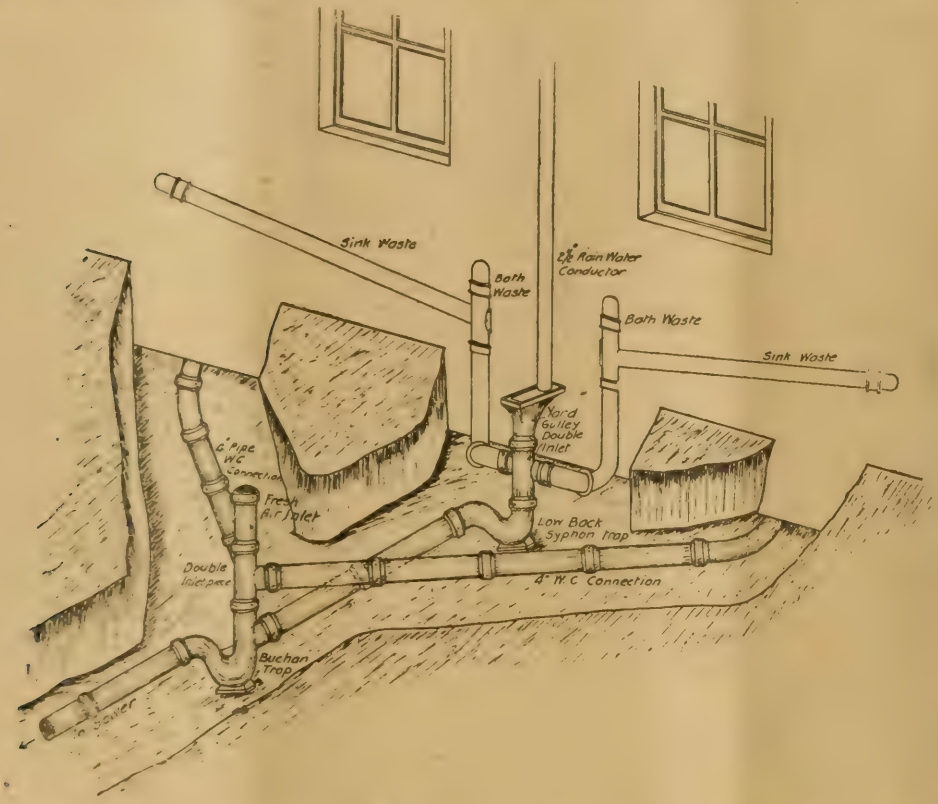
VENTILATION SHAFTS ON PRIVATE HOUSE DRAINS.

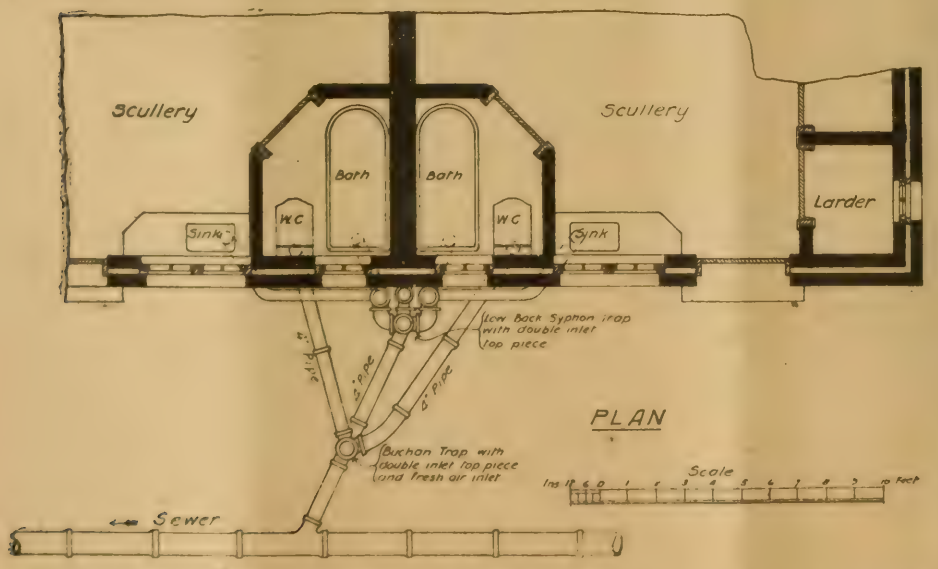
By P. C. Smith.
Burgh Engineer, Dunfermline.

In The Surveyor of January 26th the writer of "Scottish Notes" mentioned that, in connection with more than one housing scheme recently undertaken in Scotland, ventilating shafts have been left out of the separate house drainage systems: the writer at the same time expressed the belief that the Dunfermline City Council were the first to allow this in connection with the operations of the Scottish National Housing Company at Rosyth.

The accompanying drawings will best explain the situation. At a conference which took place between the architects of the Scottish National Housing Company and the writer previous to the plans of the houses being submitted to the Dean of Guild Court the question was put: "Will you insist on every separate house being separately connected to the sewer, and must each water-closet have a ventilation shaft?" This arrangement involved a disconnecting trap, with a trap on the bath waste, another on the sink waste, and a yard trap, with 18 ft. of 4-in. ventilation pipe in addition.

As the sewers run behind the houses, and within 10 ft. of the back walls, the writer saw no use for a ventilation shaft. In addition, as each pair of houses lent themselves to a combined system of drainage, the writer agreed to drain the houses in pairs. The disconnecting trap is close to the sewer, having a "two-way" piece to take in the water-closet drains. The back inlet of the trap takes in the rest of the drainage, which is gathered into one trap at the wall foot. The trap is a low back syphon with "two-way" piece and





The Surveyor
And Municipal and County Engineer.

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"bell" top to take the rain water conductor and the yard water. The bath and sink wastes are brought into the same cast-iron wastes and discharged into the side of the trap.

By this method, which is giving every satisfaction, and has been copied elsewhere, five traps and 36 ft. of ventilation pipe are saved, to say nothing of the appearance of the back wall, which would have been anything but beautiful with a series of 4-in. pipes stuck up against it.

Local Government Board and the Dublin Municipal Workshops.—The Local Government Board have written to the Dublin Corporation intimating that a number of complaints have been received respecting the management of the Stanley-street workshops, and requesting a sworn inquiry into the matter. The board ask for a copy of the findings of the corporation special committee as soon as possible.

A Natty Pen Clasp.—Messrs. M. Butler & Co., of 12 Bridge-street, Belfast, are the sole suppliers of an exceedingly neat and ingenious fountain-pen clasp, which they call the "Up-to-date." Our illustration, which is full size, gives a clear idea of it. The monthly calendar, which is interchangeable, is protected by a celluloid window, through which the dates are easily legible. The clips are made for pencils (to which they act also as point protectors) as well as fountain-pens, the only difference being in the circumference of the spring clip which holds the pencil or pen. "Natty" is perhaps the most expressive word to apply to this novelty, which is sold at 1s. post free.

Full Size

East Sussex County Council and German Prisoners.—At the meeting of the East Sussex County Council on Tuesday last, Major Thornton, on behalf of the Roads and Bridges Committee, stated that the War Office had refused to accede to the employment of German prisoners of war by the committee. The committee would have liked to employ the men on the Seaford and Newhaven road in view of the unsatisfactory work of the conscientious objectors. There was, observed Major Thornton, not much to get out of the conscientious objectors in any shape or form.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Should we not take seriously the notes of warning that have been sounded as to the serious menace to London's health due to the non, or irregular, collection of house refuse? In some boroughs the refuse, owing to depleted staffs, has been allowed to accumulate for several weeks. Most of the flats and smaller houses are provided with only one sanitary dustbin of limited capacity, and when this is filled recourse has to be had to any receptacle, which too often means to one open to the air. This often stands on the footpath edge for days, and, as well as being a menace to health, is a dangerous obstruction in our unlighted streets. Should this state of things continue into the warmer months, shall we not be inviting a plague of flies and the dangers of their helping to spread disease?

* * *

Has not the time come to make serious efforts to encourage cremation by facilitating it and cheapening it? A few days ago undertakers were in serious difficulties owing to the dearth of grave-digging labour and the impossibility of getting sufficient coffins, of which there is no reserve to draw upon. Fortunately, a slight fall in the death-rate relieved the pressure for the moment, but the position would be truly serious if there were any sort of epidemic to deal with. Cremation, of course, is the proper solution, and we had hopes that it would receive an impetus through the absolute necessity for its use at the Front. But the impetus has been slight indeed, though perceptible. Should not the undertaking trade be taken over by the sanitary authorities, and they alone be responsible for the disposal of the dead, charges being fixed by statute and based upon the deceased's assessment? Might we not see the dawn of cremation for all if the law provided that no private grave be dug for the reception of a body, and that private graves be sold or opened only for the deposit of urns containing ashes?

* * *

Mr. *Punch's* discerning eye has detected the following in a Liverpool paper: "A large section of the city will find its water supply rather intermittent in consequence of a burst of the Rivington water main at Twig-lane, Huyton, near Prescot. The main has an internal diameter of 44 miles." "What an awful bore!" is our contemporary's laconic comment. Certainly a circumference of some 135 miles is unusual for a main in this country. Have they anything to beat it in America?

* * *

What did the member of the Rural District Council of Barnstaple mean when he suggested that their surveyor must have the patience of Job to allow of his being "ransacked" and tackled by councillors? Had this member been studying his Southey, who in one of his poems says, "To ransack every corner of their shifting and fallacious hearts"? Has the surveyor got a heart of this description?

* * *

Did not the excellent articles in the Special Annual Issue of THE SURVEYOR of January 26th upon "Municipal Engineering in 1916" give us much food for thought? Is not the field of municipal engineering a very wide one, and are not the problems which have to be solved in connection with the matters so ably set forth in these articles, matters which are of really world-wide importance? Is it not to be hoped that, when this terrible war is over, the general public will realise the importance of the work of the municipal and county surveyor, and that these officials will at last receive proper recognition of their valuable services to mankind?

* * *

Would it not be better for the agricultural success of this country if our farmers had more capital, and more scientific training, and required less interest on their capital outlay? Is it a fact, as stated in America, that the outcry of more men "back to the land" is quite out of date, as with improved agricultural machinery, more capital, and larger fields, the annual labour of only two men will produce enough wheat to feed 1,000 of their fellow men? Why can't we do something of this kind over here? And will Mr. Prothero take note of this query if he should happen to see it?

* * *

When the war is over, how are we going to set about the reinstatement of our roads and streets? How are we going to meet the growing shortage of housing

a considerable part of the population? What are we going to do to save the present waste of the valuable products found in our house refuse? Shall we be able to separate and use the various constituents of sewage? Shall we be able to economise in our present wasteful, small and independent electricity installations, and gather them together in more economical groups? Will transport be simplified in connection with extraordinary traffic and other complicated and congested areas? Will all the town planning schemes now so much talked about be set in hand? And finally where is all the money coming from to effect these very desirable improvements?

NOTES FROM IRELAND.

SPECIALLY CONTRIBUTED BY AN IRISH CORRESPONDENT

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Irish Notes," 24 Bride-lane, Fleet-street, E.C.]

Sanitary Condition of Smaller Towns and Villages.

The sanitary condition of a large proportion of the smaller towns and villages in Ireland is not satisfactory. A few of the towns have been provided with both a pure water supply and a modern and complete system of sewerage. The great majority of the towns are perhaps now supplied with a good and sufficient water supply, but a number of towns and many villages are still without a proper supply, while in many of the towns and villages the sanitary conditions are in other respects extremely bad. In recent years, owing to the pressure brought to bear on the sanitary authorities by the Local Government Board, and the appointment of surveyors by the urban councils, and by some of the district councils who are the rural sanitary authorities, a good deal has been done, and many of the worst cases of impure water supplies and defective sewerage systems have been, at least to some extent, remedied; but there is a vast amount of work still to be done before the towns and villages can be described as being in a thoroughly clean and good sanitary condition.

* * * *

In spite, however, of defective sewerage systems, and in the cases impure water supplies, the health of the majority of the inhabitants is not perhaps as bad as might be expected, but the prevalence of chronic sore throats in some of these towns, and other characteristics of ill-health are evidence of a tainted atmosphere and possibly a polluted water supply. The death-rate also in these places, though perhaps not excessive, is considerably greater than the average rate in towns in England and Scotland.

* * * *

Lack of Sewage Disposal Works.

In Ireland most of the towns of over 1,500 inhabitants are now governed by urban councils, while the sanitary affairs of the smaller towns and villages are looked after by the district councils. In a few of the small towns a complete system of sewerage with sewage disposal works have been established, but in the majority of cases no proper system of sewage treatment is in operation, and comparatively few have adopted a system designed so that each new sewer laid and completed part of a scheme which, when finished, will form a complete system of properly laid and properly proportioned sewers leading to ground selected for disposal works. In the case of the villages the instances in which a complete scheme of sewerage and sewage disposal works have been constructed are still rarer.

* * * *

In some villages pipe sewers have been laid by the district councils in connection, and there are usually proposals for discharging into the nearest watercourse; but as the cost of piping the drainage from yards and houses either into the sewer or into the nearest watercourse is often the principal or only reason why a house is not connected with a local ditch or drain, it is understood that the surface-water drains laid by the county councils in their performance the grand juries. These surface-water drains are in some cases of the open variety laid and bonded with cement, and in many cases discharge into a large volume of water where no nuisance is likely to arise from a small flow of sewage, there seems little objection to leaving junctions along these pipes and permitting householders in the village to connect their premises with the county pipe. In this way a duplicate system of sewers and drains is avoided; and a good deal of expense is saved. Where, however, the county surface water drains are built of rubble masonry, or are fireclay pipes indifferently laid, and with puddle joints, or in cases where the pipes discharge at an outfall where a nuisance would be caused by the admixture of sewage with the surface water, it is evident that a separate system must be established for dealing with the sewage of the town or village.

* * * *

An Administrative Difficulty.

It is rather to be regretted that, while the roads and streets in these towns and villages are in the charge of the county surveyor, the sanitary work is looked after by the engineer to the district council. There seems, however, no reason why these two officers should not meet occasionally and arrange for the carrying off of both sewerage and surface water by the same system of pipes where possible. It would be found that the district councils would be much more willing to pass proposals for work which would serve the double purpose than where, as at present, they are sometimes called on to approve of a proposal for a surface-water pipe and at another time for a sewer. In these places disposal works for the treatment of the sewage are seldom absolutely necessary, and in some cases are indeed not required, but in those places where treatment is required the flood water could easily be discharged at the outfall by an automatic arrangement, while the dry-weather flow could be suitably treated.

* * * *

Domestic Sanitation.

It is not, however, at the outfall, but at the other end of the system, that nuisances usually arise—in the want of any sanitary accommodation of any sort in many houses, in privies, in back yards, in badly paved yards the soil of which is saturated with manurial matter from various animals, in the absence of proper gullies and of channels leading to them, in the practice of throwing out slops of all sorts at either the back or front door of the houses, and in many other ways. Every medical officer of health and sanitary officer no doubt does his best to have nuisances abated in his own district, but in too many instances these efforts are thwarted by influences which it is unnecessary to name, by the apathy of householders and by the difficulty there is in getting them to appreciate the great benefit to be derived from healthy surroundings.

* * * *

It seems improbable that any great improvement will be effected in the sanitary condition of these small towns and villages until a medical officer of health is appointed for each county. This officer should have full power of inspection of all premises, with power to prosecute offenders on his own initiative. In the event of any householder failing to carry out an Order made against him, the medical officer of health should then be empowered to get the necessary work done, so far as the removal of any existing nuisance or the provision of external sanitary work might be required, and to recover the cost of so doing from the offender. It would be a great advantage if every sanitary authority had a complete and well-thought-out system of sewers laid off on a large-scale map for each small town and village within their area. Then, instead of the constant cleaning out and repairing of old masonry sewers and surface-water pipes and the laying of new pipes in portions which might, presumably, be found useless in connection with the carrying out of a complete scheme for any of these places, proposals could be approved of each year by the district and county councils concerned for the laying of a certain length of pipes forming part of a combined scheme for the proper drainage of each small town and village. In this way, instead of laying surface-water pipes and sewers indiscriminately as at present, or of borrowing a large sum to carry out a complete system at once in any particular place, a scheme could be executed by degrees, and at no greater cost in many cases than is at present incurred in laying pipes which may be sufficient for the moment, but which are not designed to form part of a combined scheme of drainage for the place and which would presently become useless when it became necessary to carry out extensions or to provide a complete scheme.

Recent Practice in the Purification and Softening of Public Water Supplies.*

By FRED C. UREN, M.Inst.C.E.I., Surveyor to the Aldershot Urban District Council.

Open sand filters for artificially purifying public water supplies have now been in use for nearly a hundred years, and so deep was the conviction of their hygienical efficiency that the design remained unaltered for nearly one-half of that period. The conditions of working have, however, received considerable attention from engineers of recent years.

The action of the filter so well known to all water engineers is that after two or three days' use a slimy deposit of organic matter is formed on the surface of the sand containing algæ and various forms of bacteria which effect considerable bacterial purification. Until this scum has been formed a sand filter is, however, not considered to be in a fit condition for effective use, and in order to reduce the ineffective period, clogging is sometimes induced artificially.

In this film 98 per cent of the bacteria in the water is arrested; nitrification also takes place, with its consequent disintegration of the organic matter.

When the sand becomes too clogged to pass the water at the required rate (usually from 4 in. to 6 in. of descent per hour, or 50 to 75 gallons per square foot per day of twenty-four hours), under a moderate head, a thin film of sand is removed, averaging about 1 in. in thickness, until the bed is reduced by successive parings to about 12 in., when it is restored to its original depth. The interval between the scrapings varies from a few days to several weeks, according to the condition of the water, the fineness of the sand, and the period of the year. The amount of water used for washing varies still more, ranging as it does from 3 per cent to 0·3 per cent, while the cost of cleansing averages from 6½d. to 7d. per cubic yard of sand in many British works.

Of course, this clogging of the surface, whether natural or forced, is attended with a practical disadvantage in the working of the filter, and it has long been recognised as one of the greatest drawbacks to slow sand filtration.

MULTIPLE FILTRATION.

"The interest aroused in connection with this subject has resulted in the formation of two distinct methods of practice based on widely divergent theories. On the one hand, those who support the theory that the bacterial purification of water by filtration is chiefly due to the mechanical action of straining have developed the mechanical filter, in which a film is created artificially by the use of a

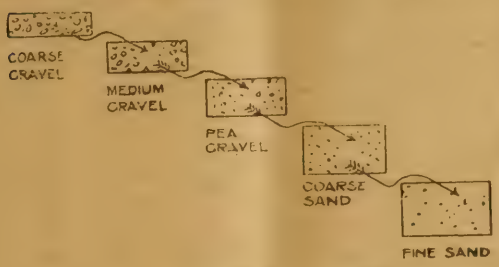

Fig. 1.—Multiple Filtration.

coagulant, and a high speed is adopted. On the other hand, Armand Puech proved by experiment and observation that the formation of a film on the surface of a filter was a hindrance rather than an aid to purification, and Puech and Chabal have developed the system of multiple filtration, which is founded on the now ascertained fact that the formation of a film, either natural or artificial, on the surface of the filtering medium is unnecessary and undesirable. In the system of multiple filtration the slow sand filter is retained, but the water is previously clarified by passing through successive layers of gravel and sand. (See Fig. 1.) During this preliminary treatment all solid matters in suspension are eliminated, together with the spores of algæ, so that no film can form on the surface of the final filter. As the nitrifying bacteria are not retained on the surface of the sand, they penetrate into the filter itself to a considerable depth, so that the bed becomes an active agent of purification, and not merely a support for the filtering layer of limited efficiency on its surface. Yet it is found that slow sand filters, which form the final elements in a system of multiple filtration, will, without the formation of a film, give far better results chemically and bacteriologically than filters on which a film is allowed to form."†

Fig. 2 gives a diagrammatic section through an installation at Bamford, Derbyshire, which deals with water from the impounding reservoirs at Derwent and Howden. It has a capacity of 12,000,000 gallons per twenty-four hours, and consists of three series of degrossisseurs divided into sixteen compartments, any one of which may be isolated for cleaning without interrupting the working of the remainder.

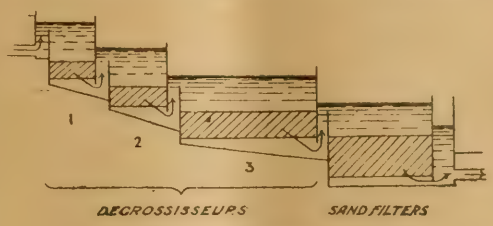

Fig. 2.—Multiple Filters at Bamford.

There are no pre-filters, and the water passes direct from the degrossisseurs to the slow sand-filters. The degrossisseurs are fitted with an apparatus for cleaning the gravel by means of air, and the amount of labour required for working the installation is very small. The sand filters have a total filtering surface of 189,000 sq. ft. The speed adopted is as follows:—

Degrossisseurs, series 1	21·62
,, ,, 2	15·04
,, ,, 3	5·75
Sand filters	0·5

There is usually a large amount of acidity in the raw water, due to the peat in the drainage area, and it is found that the acid increases after heavy rains.

The degrossisseurs series 1 and 2 contain crushed limestone as the filtering medium, which has been found to effect complete neutralisation of the peaty acids in the water. In the third series the filtering medium is screened calc spar, and Leighton Buzzard sand is used in the final filters. Although in this particular installation the system of multiple filtration has only been partially adopted, the result of preliminary straining through three successive layers of gravel is to increase the life of the final filters between scrapings from four and a-half to nearly six times, with a resulting saving in labour.

The working expenses for the year 1913 amounted to 4s. 6d. per 1,000,000 gallons, or 0·054d. per 1,000 gallons. These figures include the cleaning of the degrossisseurs, with maintenance of the oil engine and blower used in cleaning, scraping of sand filters, &c.

It is usual to speak of the system as triple filtration, but there may be as many as six series of filters in a plant dealing with a very turbid water, as at Cawnpore, Accra, Magdeburg, &c. The object to be attained is to supply the sand filters with a physically clear water. As is well known, except in rare instances filtration plants dealing with river waters are supplied with decanting basins or settling tanks, which occupy much space, and the cost of which has to be added to that of the filters. In the case of multiple filters, settling tanks should not be necessary. The total area of sand filters, roughers, and pre-filters should not exceed the area of sand filters alone when these are supplied from settling tanks, and the efficiency of the sand filters is far greater.

* From a paper read at a meeting of the Institution of Civil Engineers of Ireland on Monday last at Dublin.

† W. Clemence on "Theory and Practice in the Filtration of Water." Institution of Mechanical Engineers, April 1916.

MECHANICAL FILTRATION.

Mechanical or high velocity filtration has its origin in the United States, where the sources of supply are commonly [illegible] rivers heavily charged with suspended matter, which clog the slow sand filters.

From these unusual conditions which governed their initial use, it is stated that quite 70 per cent of the water supply of America is now filtered by this means.

Their introduction into this country began about twenty years ago, and they are now being used to such an extent that it is necessary for engineers to recognise their applicability, and as far as possible their deficiencies, in the purification of water.

They may be divided into two groups. In the first are those in which the water is run under pressure with or without previous chemical treatment through sand or proprietary material in a closed filter of iron or steel plate, as in the case of the Candy, Reeve, Bell and Jewell pressure filters.

The second class comprises filters in which water sometimes previously treated is run through sand or proprietary material in open tanks, but under a pressure which is considerably greater than that used in the slow sand beds, as in the Mather and Platt, and the Paterson open filter and the Jewell gravity filter. The filtering medium in all except the Candy filter is sharp, silicious sand or crushed quartz, to the depth of 3 ft. or 4 ft. in the filter.

Except in the three following, with which the author has been directly associated, sulphate of alumina is used as a coagulant, in order to increase the filtering capacity of the sand. This precipitate, which is deposited on the surface of the sand (in pursuance of the surface film theory), fixes the colouring matter, and entangles the suspended matter and bacteria present in the water.

From a half to two grains of sulphate of alumina is used, the amount depending on the quality of the water. By means of specially designed appli-

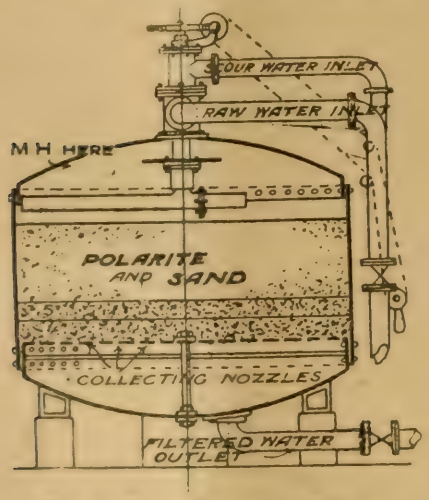

Fig. 3.—Candy Single-bed Filter.

[illegible] the amount of alumina can be admitted with a fair degree of accuracy, proportionate to the amount of water dealt with.

Cleansing is usually required after twelve to twenty-four hours, though the efficiency of the filtering medium may remain unimpaired for several days in treating comparatively clear water. The cleansing, which takes about twelve minutes, is accomplished by reversing the flow of water, and causing it upward through the several layers, and thoroughly scouring the whole.

The Candy Filter.—In the compound and single variety, are filled with proprietary substances known as polarite and [illegible], both largely composed of [illegible] oxide of iron and of silica, the latter being harder and less readily disintegrated than the former. Both substances are porous, in- [illegible] and absorbing.

The diagram (Fig. 3) shows the closed steel cylinders containing the various layers of filtering media. The water is admitted to the air chamber, [illegible] by compressed air, and thoroughly mixed with atmospheric oxygen before passing to the first section of the filter.

It then passes to the second layer where the iron is converted from the soluble bicarbonate into the soluble hydrated ferric oxide. At this stage the water has parted with the greater portion of suspended impurities, and there is thus little for the third layer to do beyond removing the precipitated oxide. The water issues from the filter bright, clear and palatable. The success of the filter appears to depend upon the effectiveness of the polarite layer.

The second type of filter made by Messrs. Candy is that by which a minute dose of chlorine is added to the water by which they claim to remove all pathogenic or fæcal bacteria from water intended for domestic consumption. The chlorine is mixed with the water, allowed to remain for some time in contact with it, then afterwards removed by passing it through an insoluble dechlorinating agent.

At Reading these filters work at the rate of 32,000 gallons per square yard per day, or eighty times the usual rate of sand filters.

The Ransome Continuous Filter.—A distinctive feature of this filter is the use of a gradually moving body

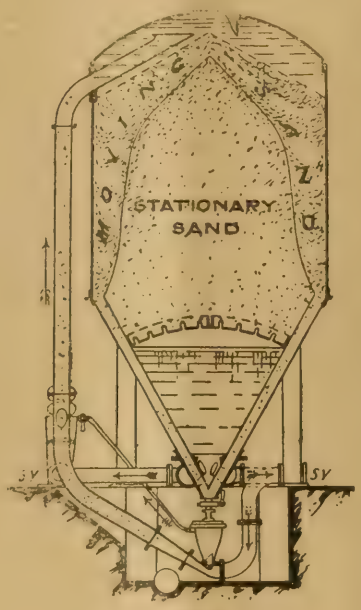

Fig. 4.

of sand as the primary filtering medium. The moving sand forms in itself a perpetual series of filtering films and, governed by its angle of repose, gravitates grain by grain towards the washing chamber at the base of the filter, whence, after thorough cleansing, it is continuously raised by the incoming water, and redeposited upon the top of the moving sand at the filters' apex.

This feature admits of an increased rate of filtration and necessitates backwashing of the medium once in about forty days only.

In addition to the moving sand there is, as shown in the section (Fig. 4), a stationary cone-shaped body of graded sand, quartz and gravel, which forms the final filtering media, and by its shape adds greatly to the capacity of the filter. The cone, as a matter of fact, is two and three-quarter times the horizontal area of the filter. This, coupled with the absence of mechanical parts, enables the filters to be grouped together more economically, less space is required, and the cost of necessary buildings reduced.

It can be equally advantageously employed with the use of coagulants, or with liming apparatus as a combined softening and filtration plant, and for the removal of iron.

The Turn-Over Rapid Filter.—Compared with the other rapid filters undoubtedly the important feature of this type is the method of cleansing the bed. It has the added advantage, too, that somewhat less head is required for cleansing and working, and the process of cleaning is not dependent upon a supply of water under high pressure, as the bed is cleansed by turning it over in the water contained in the chamber, and only a slight reversed flow of water is required, whilst the turning movement is supplied by a small water motor, gas,

or oil engine. The filtering medium consists of clean crushed quartz crystals, which does not require renewal.

It is scarcely necessary to go further into mechanical details, as these do not govern the results to any appreciable extent and we are after all chiefly concerned with the results obtained from the filters in general.

In the removal of suspended matter from the water there can be no question of the efficiency of mechanical filters; that they render the water clear, as tested by the 2-feet tube, is testified by many observers throughout the country.

The efficiency of the mechanical filter must be measured by the character of the water to be treated. In the case of deep well water, for example, where it is already bacterially pure, treatment may be required only for the removal of the iron found in solution which attacks all metallic iron with which it comes in contact, choking the mains and discolouring the water, and impairing its usefulness for industrial purposes.

Here the installation of mechanical filters may be all that is necessary. In the process the water must be aërated to cause oxidation and precipitation. In the Candy filter, which is in use for this purpose at Hastings, Tunbridge Wells, Cromer, Hooton and other places, the aëration is conducted within the filter.

Taking Hastings as an example of a highly ferruginous water, though otherwise pure, on account of the iron in solution and suspension it was extremely difficult to keep the sand bed filters in condition. The surfaces soon became coated with a layer of oxide of iron,, which more or less sealed the beds, and necessitated frequent skimming, at a cost of from 0·08d. to 0·1d. per 1,000 gallons; recourse was then had to larger beds and an increased depth of sand, but in 1899 a battery of six mechanical filters was installed, and in 1902 four more, for which the Local Government Board granted a loan repayable in thirty years.

The crude water was turbid and discoloured, and contained nearly one grain of hydrated oxide of iron per gallon. After filtration it was colourless, yielded no deposit, and practically the whole of the iron in solution and suspension was removed as well as the free and albuminoid ammonia.

The cost of filtering per 1,000 gallons was 0·012d. to 0·025d.; the quantity of water used for washing the pressure filters ranged from 0·38 to 0·5 per cent. A similar experience was met at the Hooton works of the West Cheshire Water Company, where the iron oxide reduced the bore of the mains from 1 to 3 per cent per annum, and millions of gallons of water were used in main flushing to get rid of the discoloured water.

In 1906 my friend P. H. Bettle, who was then acting for the company, advised an installation of mechanical filters, which was duly acted upon, and although the water contained ·5 grain of iron per gallon prior to filtration, after treatment no trace of it could be found. The same measure of success has been attained at Crewe, Tunbridge Wells, and Biggleswade.

As regards the removal of peaty colouring matter, the mechanical filter with the aid of the alumina appears from the examination made by careful and accomplished observers to act more efficiently than slow sand filters.

Professor Delepine, in making observations on the filtration of moorland water supplies by means of mechanical filtration and coagulants, stated that the water which before treatment varied in colour from greenish or brownish yellow to brown and dark brown, was invariably deprived entirely, or almost entirely, of its colour. The results of thirty-two examinations of the treated water gave the following results:—On twenty occasions it had a clear blue colour, and on twelve a greenish blue colour; in the latter cases more than 95 per cent of the original yellow or brown discoloration had been removed.

In the case of plumbo-solvent waters generally associated with moorland water supplies the removal of peaty acids is imperative. Whenever water exhibits an acid reaction, it may be regarded as plumbo-solvent. This term refers to the action of certain natural waters on lead. Natural waters seldom dissolve lead, but the addition of storm water may render them active, especially if part of the drainage comes from moorland. The action of peaty water is frequently rapid; as much as two grains per gallon can be dissolved in a few minutes.

The comprehensive examination by the Local Government Board of moorland supplies in Yorkshire was due to the numerous reports as to the effect on consumers. To counteract the action, neutralisation may be carried out by the addition of lime or carbonate of soda which in the process of mechanical filtration is added in sufficient quantity through a measuring or chemical supply gear to neutralise the acidity and at the same time react on the alumina forming the coagulant.

As regards the bacterial efficiency of mechanical filters, Frankland showed that an average of 95·7 per cent purification was obtained with a year's weekly samples, the unfiltered water containing from 45 to 793 bacteria per cubic centimetre, the water being obtained from an upland source not exposed to pollution.

At York, where mechanical filters are used for preliminary treatment before filtration through slow sand filters, the average reduction in the water (which is obtained from the Ouse) was 86·2 per cent without the use of a coagulant; but with the addition of 1 grain of sulphate of alumina per gallon in an experiment lasting six days an average reduction of 93·37 per cent was the result.

At Bolton Radcliffe found in a series of weekly examinations, extending over fifteen months, that the average reduction of bacteria was 95·6 per cent where the water contained from 52 to 793 organisms per cubic centimetre.

(To be concluded.)

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

APPLICATION FOR LOAN.

Bury T.C.—£2,000 for the installation of toluol extraction plant.

LOANS SANCTIONED.

Walthamstow T.C.—£18,790 for the extension of the electricity works.

Woolwich B.C.—£23,152 for further extensions at the electricity works.

Timber, Plywood, and Woodwork.—In next week's issue there will appear a page advertisement which will give various particulars of timber, plywood, and woodwork which Messrs. C. Jennings & Co. have for sale. The page will be found useful for reference by all who make use of such goods. The firm's head office is at Pennywell-road, Bristol, but they have branches at Leicester, Porthcawl, and stocks warehoused at Swansea, Hull, Pembroke Dock, Neyland, Newcastle, Manchester, Liverpool, and elsewhere.

Criticism Brings Vote of Confidence.—At last Monday's meeting of St. Andrews Town Council, on the motion of Colonel Thomson, the Standing Orders were suspended in order that he might move a vote of confidence in the burgh surveyor, Mr. Wm. Watson. The Colonel (reports the *Dundee Advertiser*) said that in the eight or nine months he had been in the council he had noticed a steady stream of criticism directed against the town's officials. This applied especially to the burgh surveyor, whose position was such that he was unable to defend himself. On different occasions the allegations had been found to be wrong, and yet neither apology nor withdrawal had been made. He thought the best way to meet the situation would be by passing a vote of confidence in their surveyor, whom he considered was a good public servant and conscientious worker. Dr. M'Tier seconded. Bailie Hall said he would like to associate himself with the motion. Mr. Watson was a very capable official. Bailie Reid said all the attacks had emanated from the same two men. The motion was unanimously agreed to.

"Subscriber for Twenty Years" writes: "I congratulate you, Mr. Editor, on the excellent annual number of 'The Surveyor,' notwithstanding the war. It is much better than one could reasonably expect—indeed, the annual summary or review is quite one of the best. I usually keep it at my elbow for purpose of reference, not only in the latest law notes and engineering practice, but as a ready list of advertisers, the names and addresses of practically all the firms needed in one's work being found therein.

Municipal Work In Progress and Projected.

The Editor solicits the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Brixham U.D.C.—It was stated that the breakwater had stood the recent violent gale in a most satisfactory manner. The structure, it was added, had not only been made without any charge upon the rates, but £1,000 out of the harbour funds could be put in the War Loan, thus showing it was a sound undertaking.

Burnley T.C.—The town council decided on Wednesday to accept the offer of the Carnegie Trust of £15,000 towards the cost of providing a central free library.

Dundee T.C.—Under the direction of the city engineer, Mr. J. Thomson, it is proposed to build a piggery in reinforced concrete at Ashludie sanatorium, at an estimated cost of £250.

Glasgow T.C.—A report has been prepared on the effect of certain provisions of the Building Regulations Act, 1900, in regard to the building of dwelling-houses, and it will be submitted at the next meeting of the corporation.

Northumberland C.C.—The council have approved a scheme for dealing further with tuberculosis. Three new dispensaries will be provided, and 111 beds in existing institutions, the cost being £12,582.

Torquay T.C.—It was reported that the annual sum required to pay principal and interest on the loan for the new town hall amounted to the product of a 2½d. rate, reducible by £150 per annum saved in the rental of premises formerly occupied as offices, and the receipts from the lettings of the new town hall estimated at £200 per annum.

HOUSING AND TOWN PLANNING.

Birmingham T.C.—The city council on Tuesday last resolved to make application to the Local Government Board for their approval to the East Birmingham town planning scheme amendment scheme, 1916. It was stated that important development schemes were being considered in committee.

Dublin T.C.—In connection with the proposed American loan, the city architect has, at the request of the Dublin Corporation Housing Committee, revised the estimates for the various schemes proposed to be carried out. The revision has been made necessary by the increased cost of materials and labour. It represents roundly an increase of 25 per cent on the original estimate. The revised cost of the different schemes is as follows: McCaffrey estate, £66,812; St. James'-walk, Rialto, £15,375; Fairbrother's Fields, £200,250; completion of Ormond Market area, £11,102; Spitalfields (amended scheme), £52,243. In connection with the Fairbrother's Fields scheme, the city architect has prepared a revised outline plan, which is to include provision for baths and wash-houses and a reading-room. Provision is to be made on the best frontages for houses which could be let for about £26 a year.

Waterford T.C.—The Housing Committee recommended the acceptance of the tender of Mr. George Nolan at £4,613 for the erection of nineteen work[illegible]

MOTOR TRANSPORT.

Batley T.C.—The question of purchasing a motor lorry for the gas works is under consideration.

Halifax T.C.—A motor van is to be purchased for municipal purposes at a cost not exceeding £190.

REFUSE COLLECTION AND DISPOSAL.

Scalby U.D.C.—The Sanitary Committee have left it to the surveyor to arrange with residents in the district requiring the services for the removal of old pots, pans, and dry ashes for a period of three months as an experiment at a charge of 1s 6d a load.

ROADS AND MATERIALS.

Ballichorough (Cavan) R.D.C.—The council have adopted the county surveyor's recommendation to bring the direct labour scheme into existence.

Barry U.D.C.—The Public Works Committee are preparing an estimate of the cost of constructing the main roads with clinker.

Belford R.D.C.—The council have agreed to the suggestion of the surveyor, Mr. T. W. Dodd, that, failing better supplies of 2½-in. metal, he should obtain chippings (if available) on a larger scale than formerly, and tar these as required.

Cavan R.D.C.—The county surveyor estimated the probable expenditure on roads during the coming year at £10,070, while the legal limit of expenditure was only £7,800. The council decided to request the Local Government Board to sanction the increase of the limit to £10,000.

Eastbourne R.D.C.—The council have instructed the clerk to communicate with certain brewery companies claiming compensation for damage done by tractors to the road from Long Bridge to Exceat Farm.

Edinburgh T.C.—The Streets and Buildings Committee have decided, with a view to ascertaining if any further saving could be effected, to stop all new work in the roads and burgh engineer's departments until it had been surveyed and reported upon.

Grantham T.C.—The Highways Committee presented at the last meeting the estimates of expenditure on main roads and footpaths for the year ending March 31, 1918, amounting to £1,292. This included £2,096 due to making good roads which have been damaged by extraordinary military traffic. The committee reported that to carry out the various work on the roads would necessitate a start being made as soon as the weather is favourable, and as there will no doubt be the utmost difficulty in getting material and labour, the borough surveyor has been granted full power to order the material at once, and to take all steps necessary to expedite the work.

Hull T.C.—The city surveyor, Mr. F. W. Bricknell, reported to the Works Committee that the estimated expenditure on scavenging was £22,970, about £1,000 in excess of last year's estimate. That was largely owing to the increased cost of provender for the horses and to the war bonuses that were being paid. They were employing rather fewer men and carts than did the private contractors.

Kesteven C.C.—The county surveyor, Mr. W. B. Purser, presented to the Highways Committee estimates of expenditure on main roads for the year ending March 31, 1918, amounting to £29,817, as against £27,309. The increase, he said, was almost entirely due to the extraordinary military traffic in and near Grantham. Notice had been given to the Road Board, and he had no doubt that a considerable contribution would be given towards this extra expenditure. The Leasingham and Lincoln main road was repaired during the heavy traffic at a cost of £2,627, and the Road Board had paid the entire cost. It was now proposed to reinstate the whole length in the urban and rural district at a cost of £4,634, of which the Road Board will recommend the payment of £3,631, provided the county council agree to carry out the works included in the estimate.

Kingsbridge R.D.C.—It has been agreed to cut down by one-half the estimates for stone required on the district roads.

Lancaster T.C.—The borough surveyor, Mr. A. G. Bradshaw, has received instructions to repair part of Heysham-road with water-bound macadam, at an estimated cost of £375.

Newry No. 1 R.D.C.—The county surveyor of Down, Mr. J. Heron, has made arrangements by which each direct labour surfaceman is to have charge of certain roads and to work on them on fixed days of the week. The district council have therefore been furnished with a register of surfacemen, showing the road upon which each man is to work on each day of the week.

Northumberland C.C.—It is proposed to employ a number of German war prisoners at the county quarry at Knowles Gate, where three sheds will be built for the accommodation of the men, who will be under the control of the military.

Plympton R.D.C.—The Prisoners of War Employment Committee have written stating that, owing to the very large demand for this labour for work of the

most urgent national importance, they regret it is impossible to make any allocation of prisoners of war for road maintenance work. On the other hand, the Road Board state that the War Department are considering a scheme by which local authorities will be able to apply direct to the commandant of the nearest prisoner of war camp in order to obtain gangs of prisoners for work by the day upon the understanding that the prisoners are only available for a short period, and are likely to be withdrawn at very short notice. The district council would therefore clearly see that the employment of prisoners of war on work of road maintenance cannot be relied on.

Salop C.C.—The council, it was reported on Saturday, have now only one workman for each 7 miles' length of road, instead of three, while much of their material for road repair was being commandeered.

Stockton T.C.—The town council have agreed to repair the roadways over the three North-Eastern Railway bridges in Yarm-road, at a cost not exceeding £600, to be met by the railway company.

SEWERAGE AND SEWAGE DISPOSAL.

Cheltenham T.C.—The Public Health Committee recommend the reconstruction of the brick sewer in Commercial-street, at an estimated cost of £320.

Rugby R.D.C.—With respect to complaints about polluted wells at Hillmorton, the Local Government Board have written inquiring whether the wells are to be closed, and hoping that the council will consider the provision of an improved system of sewerage for the parish as soon as circumstances will permit.

Wath R.D.C.—The sanitary inspector has received instructions to prepare specifications for an improved sewerage system for Rainton.

Wath U.D.C.—A proposition to engage Mr. J. H. Drew, borough surveyor of Grantham, to superintend, for a sum of £180, the completion of the sewage works extension scheme, which he engineered when he was surveyor to the Wath Council, has been referred to a special meeting of the council.

WATER, GAS, AND ELECTRICITY.

Barrow T.C.—The corporation are seeking to obtain additional water from the River Duddon, and have lodged a Bill in Parliament. When a Bill was promoted a few years ago, there was opposition from mining and iron companies, but on this occasion there is no opposition on these counts, but the Bootle (Cumberland) Rural District Council and the Ulverston Rural District Council are to oppose the measure.

Islington B.C.—It is proposed to provide an additional feeder main at the electricity works at an estimated cost of £4,000.

Shoreditch B.C.—The borough electrical engineer has prepared a scheme for the installation of a turbo-generator set at Whiston-street electricity works, at an estimated cost of £11,000.

Todmorden T.C.—The Electricity Committee recommend the installation of a 1,000-kw. turbo-generator, with auxiliaries, at an estimated cost of £10,000.

MISCELLANEOUS.

Belfast T.C.—The Improvement Committee have allocated 20 acres of land at the outfall works for allotments, and 26 acres of land at Sydenham Station.

Dublin T.C.—In a report by the Municipal Estates and Finance Committee it is stated that a proposal referred to them by the city council to increase the wages of full-time municipal employees from 25s. to 30s. per week, rising to 35s., would involve an increase of £18,500 on the estimates. The committee refuse to accept the responsibility for whatever action the city council take with respect to the matter.

St. Helens T.C.—The borough engineer, Mr. A. W. Bradley, has issued leaflets offering land for allotments at nine points in the borough—300 sq. yds. at a rent of 1s. a year, with seed and manure at cost price. The allotments have been taken up by a large number of people.

York T.C.—The accounts of the tramways and motor omnibus services for the last financial year showed receipts amounting to £35,735, leaving a nett surplus balance of £11,202.

The Decimal System.—East Sussex County Council on Tuesday adopted a recommendation of the Weights and Measures Committee supporting in principle the decimal system of weights, measures and coinage in the United Kingdom.

SOCIETY OF ENGINEERS.

PRESENTATION OF PREMIUMS.

At a meeting of the Society of Engineers, held on Monday last, the premiums awarded by the council for papers read before the society during 1916 were presented by the retiring president, Mr. Percy Griffith, M.INST.C.E., F.G.S., as follows:—

The President's Gold Medal to Prof. C. G. Cullis, D.SC., for his paper on "The Mineral Resources of the British Empire as regards the Production of Non-Ferrous Industrial Metals."

The Bessemer Premium, value £5 5s., to Prof. W. G. Fearnsides for his paper on "The Mineral Requirements of the British Iron and Steel Industries."

The Bernays Premium, value £3 3s., to Prof. J. A. Fleming, M.A., D.SC., for his paper on "Engineering and Scientific Research."

The Nursey Premium, value £3 3s., to Mr. J. E. Lister, Wh.Ex., ASSOC.M.INST.C.E., A.M.I.M.E., for his paper on "Modern Coal and Coke Handling Machinery, as used in the Manufacture of Gas."

The Society's Premium, value £2 2s., to Mr. Ewart S. Andrews, B.SC., for his paper on "The Design of Continuous Beams."

Mr. Henry C. Adams, M.INST.C.E., M.I.MECH.E., F.R.SAN.I., president for the year 1917, was then invested with the badge of office, and delivered his presidential address, in which, after touching on the long connection which he, his father, and grandfather had had with the present society and its forerunners, the old Society of Engineers and the Civil and Mechanical Engineers' Society, he pointed out the desirability of some federation of engineering bodies, and the disadvantages to the profession and the public of the present multiplication of specialist societies having in many cases almost identical objects and interests. He then outlined a scheme for such a federation with a general engineering council for its head, and representing all sections of the engineering profession, the specialist societies being co-ordinated and forming in effect branches of the main body. This general council would wield enormous power both in moulding public opinion and in upholding the status and interests of the profession as a whole. He then dealt with the classification and training of engineers, and the great need for the more general recognition of science in all branches of education, and called attention to the important memorandum on the neglect of science signed by many eminent men which was published in the *Times* of February 2, 1916, and the subsequent meeting, where resolutions were passed recommending the Government to assign capital importance to the natural sciences in the competitive examinations for the Home and Indian Civil Service and for admission to Sandhurst. In conclusion, he suggested that the time is opportune for the reform of our present system of weights and measures and the adoption of the metric system.

Liverpool Tramway and Electricity Profits.—Liverpool Tramways and Electric Lighting Committee have decided to vote £125,000 from the tramways receipts towards the relief of the rates, and £65,000 from the electrical undertaking for the same purpose—a total of £190,000. Last year the tramways contributed £100,000 to the reduction of the rates.

Salford's Allotments.—The question of land cultivation in Salford is engaging the attention of a committee appointed by the Salford Corporation. Mr. Platt, the building surveyor, at the request of the mayor (Councillor Higson), prepared a plan showing that, apart from park land, there were about 800 acres of land unoccupied in various parts of the borough. Unfortunately, in many parts the soil is regarded owing to its shallowness, as being quite unsuitable for the cultivation of vegetables.

The Coroner's Pigsty.—On Wednesday, at Braintree, the urban district council had before them plans sent in by Dr. J. Harrison, the East Essex Coroner, for a model pigsty, which he intended to erect in the ornamental gardens opposite his residence in Bank-street, a narrow thoroughfare in a congested area. It was decided to suggest to the coroner that his model sty could be built in the gardens at the rear of his house, and that if he desired it publicity could be obtained by erecting an advertising board in his front garden.

PERSONAL.

Mr. E. Wilton, acting deputy borough surveyor of Deptford, has been appointed surveyor to the Beddington and Wallington, Surrey, Urban District Council.

Mr. Langton, municipal engineer of Lahore, has taken up service in the Army, and Mr. Hukumchand, municipal sub-engineer, has been appointed to act in his place.

Mr. William Newbigging was on Wednesday last appointed temporary consulting engineer to the Manchester Corporation Gas Committee, at a remuneration at the rate of £1,000 per annum.

Mr. T. J. Wheeler has been appointed deputy-surveyor to the Ottery St. Mary Urban District Council during the absence of the surveyor (Mr. H. Finister) on military service.

Major A. T. Davies, the county surveyor of Shropshire, who has been on active service and has been wounded, was welcomed back to duty last week by the members of the county council.

Mr. T. Moulding, city surveyor of Exeter, was on Tuesday last voted an increase of his salary from £600 to £700 per annum, in recognition of increased duties through the extension of the borough.

Mr. John R. Mead, borough engineer and surveyor of Ipswich, has received permission from the town council to take up a commission in the Royal Engineers for road service in France, under Brigadier-General Maybury.

Mr. M. S. Stobbs, acting county surveyor of Shropshire, has been granted an honorarium of £100 for his special services during the absence of the county surveyor on military service. His salary has also been increased so as to bring it at the end of the year to £400.

Mr. F. S. Cutler, Assoc.M.Inst.C.E., deputy borough engineer, having rejoined the Royal Engineers, the whole of the technical and clerical staff of the borough engineer of Deptford, Mr. F. Wilkinson, Assoc.M. Inst.C.E., are now with the Forces, Mr. Wilkinson being the only member of the department for whom the council has applied for and been granted exemption.

Mr. A. Rothera, surveyor to the Spenborough Urban District Council, will receive the sympathy of his many friends on account of the sad death recently of his little son Cecil, who was accidentally killed by a motor wagon. Another son, a few years older, had a narrow escape, being also thrown under the wagon, and he is suffering from severe scalp wound and shock.

Mr. J. Jackson, superintendent of the Birmingham refuse disposal department, has had his salary increased from £500 to £550 a year. It was stated that Mr. Jackson had remodelled the work of his department, and introduced various schemes which had resulted in pecuniary benefit to the corporation. The sorting and sale of waste paper alone would bring in £500 a year, while the treatment of old tins represented a further revenue of many hundreds a year.

Bath Surveying Committee on Monday last had before them the report of a Special Committee appointed to consider the question of the surveyorship. It was agreed that it was inadvisable at the present time to appoint a successor to the late Mr. C. R. Fortune; that Mr. F. E. Gay continue in the position of acting city surveyor at a salary of £400 per annum; and that the matter be reconsidered when the offices of waterworks engineer and city surveyor can be amalgamated, with a view to the appointment of a city engineer. It was stated that the feeling of the Special Committee was that it was essential in the public interests that there should be two officials doing the work of the Waterworks and Surveying Committees. In many towns the offices were amalgamated. As long as the present occupants of the two offices were alive and well the question of amalgamation would not arise. But in the nature of things the opportunity would arise some time, and then the committee would be prepared to act.

OBITUARY.

Mr. David T. Ryan, architect and civil engineer, who had charge of the buildings and properties with which the Aberdeen burgh surveyor's department have to deal, died last week, we regret to state. He enjoyed the confidence and esteem of all connected with the municipal work of Aberdeen.

We regret to report the death, after a long illness, of Mr. Richard Collins, surveyor to the Enfield Urban District Council. Mr. Collins, who was 63 years of age, had been in the service of the local authority for some 25 years.

Mr. H. Howard Humphreys, M.Inst.C.E., will have the sympathy of a wide circle of friends in the engineering profession in the loss of his wife, whose death, we regret to learn, took place on Monday last at 19, Prince of Wales Mansions, S.W.

News has just been received at Exeter that Mr. Donald Cameron, who for many years occupied the position of surveyor to the Exeter City Council, and who now holds an important appointment in British Columbia, has lost his son—Sapper Euan Cameron who was attached to the Royal Naval Division. Deceased, with six other brothers, on the outbreak of the war held lucrative appointments in North Vancouver, British Columbia, but they resigned their posts, proceeded to England, and joined the Colours to play their part. They all went through the Gallipoli campaign, and then proceeded to France, where they saw a deal of fighting. Six of the sons of Mr. Cameron who joined the Colours are Lieutenant Angus Cameron, Lance-Corporal Ivan Cameron, Sappers Colin Cameron, Hamish Cameron, E. D. Cameron (killed), and H. J. Cameron. The other brother is serving with a Canadian regiment. From a letter received by an Exeter resident it appears that Euan received the wound from which he died on November 13th. The letter in question says: "Euan was in part of the Big Push—a ghastly three days. He was away up in the German lines with a lieutenant, trying to keep the Brigade Headquarters in touch with the fighting. His wire was the one wire which kept up during one long, terrible day, and by which the staff got the news that the fighting was going in our favour, and not, as rumoured, that our forces had been cut up and were in confusion. The Staff Captain said it was marvellous the way in which the wires had been kept up."

"Studs" on Road Engine Wheels.—The Local Government Board have issued as a temporary war measure an Order enabling the driving wheels of an agricultural locomotive to be provided with studs while it is being used on a frost-bound road.

Disposal of Destructor Waste Scrap at Hornsey.—With reference to the article under this heading which appeared in our issue of January 26th last (p. 123), we understand that the hydraulic scrap bundling plant installed at Hornsey was made by Messrs. Hollings & Guest, Limited, Thimble Mill-lane, Birmingham.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF COLNE.

The Highways and Sewerage Committees of the Borough of Colne are prepared to receive Tenders for the Supply and Delivery of the following Materials for the year ending 31st March, 1918:—

Lancashire and Local Setts, Kerbs, and Channels.
Portland Cement. Pitch and Creosote Oil.
Granite and Limestone Macadam.
Earthenware Pipes and Gullies.
Lime. Brushes.
Ironwork (Street Grates, Manhole and Lamphole Covers).
Leading Limestone. Team Labour.

Specification and Form of Tender and other information may be obtained on application at the Office of the Borough Engineer and Surveyor, Mr. T. H. Hartley, and Tenders addressed to the Chairman of the Highways and Sewerage Committees, properly endorsed, must be delivered to the above-named not later than 9 a.m. on Monday, the 19th inst.

The Committees do not bind themselves to accept the lowest or any Tender, and persons tendering must do so at their own cost.

(By order)
ALFRED VARLEY,
Town Clerk.

Town Hall, Colne,
Lancs.
February 7, 1917. (3,298)

SOME RECENT PUBLICATIONS.*

Knight's Local Government Reports. January, 1917. Vol. xv., No. 1.

We take the opportunity afforded by the appearance of the first number of a new volume of these excellent reports to commend them to those of our readers who desire to peruse fuller reports of law cases affecting their work than are to be found in the various "digests" that appear. It may safely be said that any municipal engineer who subscribes to "Knight's L.G.R." and receives his monthly issue will keep himself thoroughly abreast of all legal decisions which affect him in his professional capacity. Every report is prefixed by a full headnote, so that the gist of the case can be grasped at once by those who have not time or inclination to read the full judgments. The monthly issues also embody local government statutes and relevant orders and circulars issued by the Local Government Board and other Government Departments.

Water Supply. By William P. Mason. Fourth Edition. Price 16s. nett. New York: John Wiley & Sons.

The fourth edition of Professor Mason's well-known book on Water Supply testifies to the high esteem in which this book is held by the American engineering public. Published originally in 1896, it has passed through subsequent editions, each time being substantially enlarged and improved. For the present edition a large amount of the text has been entirely rewritten, and a suitable amount of new material added. The tables have been brought up to date and new photographs introduced.

Professor Mason is always a pleasing writer, and has the art of abstracting the important data from the writings of others, and presenting them in an attractive form. Although this cannot be called an exhaustive treatment of the subject it is one of the most interesting and suggestive treatises on the subject published since the old book of the same title by Professor William Ripley Nichols, of the Massachusetts Institute of Technology.

Municipal Engineering Practice. By A. Prescott Folwell. (First Edition.) Price $3.50. New York: John Wiley & Sons.

The increasing interest the United States takes in municipal affairs, and especially in city planning, has induced the author to bring together in one volume many matters which relate to municipal engineering practice in that country. He has done this in a very interesting way, and has covered the ground very thoroughly for a book of small size. Altogether this chapter is one of the best short discussions on city planning to be found in recent literature. The book is exceedingly well printed and profusely illustrated.

Work of Glasgow Fire Brigade.—During 1916 the Glasgow fire brigade received 1,549 calls, a decrease of 291 compared with the previous year. The fires due to defective building construction were numerous, the number being 246, or 35·2 per cent of the total. The lengths of hose used during the year measured about 22 miles. The expenditure of the department during the year ended on May 31, 1916, was £31,418, excluding interest and sinking fund, and the revenue was £6,669, making the nett charge on rates £24,748, or 239d. per £1. The sum received from proprietors and others for the attendance of the brigade to fires within the city boundaries amounted to £4,428.

Huddersfield and Housing: Proposed Works Department.—At the last meeting of Huddersfield Town Council Mr. Boothroyd brought forward a proposal that a committee be appointed to consider the advisability of establishing a works department for the carrying out by direct labour of all building and repairing work. In the course of a long discussion, Alderman Blamires suggested that the proposal should be limited to the appointment of a committee to consider the advisability of establishing the department in relation to housing alone, which was the pressing need of the moment. The suggestion was accepted, and it was resolved that the committee should be appointed accordingly.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

EASTERN DISTRICT.

A meeting of the Eastern District Executive will be held at the institution, 92 Victoria-street, at 3 p.m. to-morrow (Saturday).

Business.

1. To read and confirm minutes.
2. To consider the formation of a programme for the coming session.
3. Other business.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

TEMPORARY SURVEYOR AND SANITARY INSPECTOR.—February 12th.—Sherborne Urban District Council.—Mr. H. J. Seymour, clerk, Sherborne, Dorset.

SURVEYOR AND INSPECTOR OF NUISANCES.—February 12th.—Tring Urban District Council. £150 a year.—Mr. A. W. Vaisey, clerk, Council Offices, Tring.

SURVEYOR.—February 14th.—Totnes Rural District Council. £130 per annum. Mr. J. S. Portch, deputy clerk, 19 High-street, Totnes.

SURVEYOR'S ASSISTANT.—February 14th.—Aldershot Urban District Council. £2 2s. per week. Mr. D. Llewellyn Griffiths, clerk.

HIGHWAY SURVEYOR.—February 14th.—Liskeard Rural District Council.—Mr. A. de C. Glubb, clerk, Council Offices, Liskeard, Cornwall.

INSPECTOR OF NUISANCES.—February 17th.—Chatham Town Council. £200—£250.—Mr. J. Holgate, medical officer of health, Town Hall.

SANITARY INSPECTOR.—Government of Nigeria. £250—£300.—Crown Agents for the Colonies, 4 Millbank, London, S.W.

SURVEYOR, INSPECTOR, AND COLLECTOR.—Swaffham Urban District Council.—Mr. Alfred John Winter, clerk, Council Offices, Swaffham, Norfolk.

ENGINEERING ASSISTANT.—For a large water supply scheme in Ireland.—Box 1,604, The Surveyor, 24 Bride-lane, Fleet-street, London, E.C.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

CARDIFF.—February 16th.—For the extension in reinforced concrete of a sub-station, for the corporation.—City Engineer, City Hall, Cardiff.

NEWTON ABBOT.—February 17th.—For alterations and additions to the depot, for the urban district council. The Surveyor, Town Hall, Newton Abbot.

BOURNEMOUTH.—February 19th.—For taking off existing roof and constructing new roof and other works at Branksome Lodge, for the corporation.—Mr. F. P. Dolamore, borough engineer and surveyor, Municipal Offices.

LOUTH.—February 28th.—For the erection of bathrooms at the county infirmary.—Mr. V. J. O'Connell, architect, Earl-street, Dundalk.

Engineering: Iron and Steel.

CORK.—February 15th.—For the construction of filter beds and improvement of reservoir, for the rural district council.—Mr. B. O'Flynn, engineer, 60 South Mall, Cork.

GLASGOW.—February 19th.—For the supply of gas cookers and grillers, for the corporation.—Mr. A. Wilson, 45 John-street, Glasgow.

HARROGATE.—March 6th.—For the supply of the electricity works of a by-product steam boiler, over

head coal bunker, coal conveyor, and structural steelwork, for the corporation.—Mr. G. Wilkinson, borough electrical engineer, 33 Swan-road, Harrogate.

Mechanically Propelled Vehicles.

HERTS.—February 12th.—For the hire of steam and petrol rollers, for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

MANCHESTER.—February 19th.—For the supply of one or more motor sweeping machines, for the Cleansing Committee.—Mr. R. Williamson, superintendent, Cleansing Department, Town Hall.

Roads.

BIRKENHEAD.—February 12th.—For the supply of granite and Rawlestall kerbs and channels, Penmaenmawr macadam, stone and natural flags, and stoneware pipes, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor, Town Hall, Birkenhead.

BUCKS.—February 12th.—For the supply of clean, hand-picked road flints, for the county council.—Mr. E. Winfield, acting county surveyor, County Hall, Aylesbury.

MUTFORD AND LOTHINGLAND.—February 12th.—For the supply of granite, flint, gravel, and path shingle, for the rural district council.—Mr. H. Blewett, surveyor, Council Offices, Oulton Broad, Lowestoft.

WALTHAM ABBEY.—February 12th.—For tar-spraying about 7,000 sq. yds. of roads, for the urban district council.—Mr. W. C. Holloway, engineer and surveyor, Town Hall, Waltham Abbey.

NORTHUMBERLAND.—February 12th.—For supplying, breaking, and carting stone, for the county council.—County Surveyor, Moothall, Newcastle-on-Tyne.

LONG SUTTON.—February 13th.—For the supply of granite, slag, and granite chippings, for the urban district council.—Mr. S. S. Mossop, clerk, Long Sutton, Lincs.

LEYLAND.—February 13th.—For the supply of broken granite, broken slag, tar-macadam, limestone dust, kerbs, setts, rubble, concrete flags, earthenware pulleys, drain pipes, and irregulars, for the urban district council.—Mr. M. H. Wilkinson, surveyor, Council Offices.

HOLLAND.—February 14th.—For the supply of about 3,750 tons of broken granite, 1,904 tons of granite chips, 2,250 tons of slag, 200 tons of slag dust, 200 loads of coarse builders' sand, and 400 barrels of cement, for the county council.—Mr. W. H. Gane, County Surveyor, Boston, Lincs.

BIRMINGHAM.—February 14th.—For the supply of about 3,500 tons of coal-gas tar, for the corporation.—Mr. H. E. Salter, city engineer and surveyor, Council House.

CORNWALL.—February 14th.—For the supply of materials, carting, team labour, and purchase of sidings and paddocks, for the county council.—Assistant County Surveyor, Clinton-road, Redruth.

SUTTON.—February 14th.—For the tar-spraying of the footpaths, for the urban district council.—Mr. W. H. Gaffer, Municipal Offices, Sutton, Surrey.

CLAYPOLE.—February 15th.—For the supply of 1,500 tons of granite, 1,200 tons of slag, and 140 tons of footpath gravel, for the rural district council.—Mr. C. G. Fox, district surveyor, Brant Broughton, Newark.

COULSDON.—February 15th.—For the supply of bituminous tar, tarvia, tar-spraying materials, tarred tar-macadam, kerbing, pitching, channelling and setts, at paving, Portland cement, broken granite, stoneware pipes, cement, and horse hire, for the urban district council.—Mr. E. J. Gower, clerk, Council Offices, Purley, Surrey.

NEWMARKET.—February 15th.—For the supply of about 1,000 tons of the best broken Leicestershire granite, 1½-in., and 2½-in. gauge, 200 tons of best broken slag, 2½-in. gauge, 400 tons of granite or slag chippings, free from dust, ¼-in. gauge, and 250 tons of ¾-in. screened granite chippings, for the urban district council.—Mr. W. H. Eley, engineer and surveyor, Town Hall, Newmarket.

WETHERBY.—February 15th.—For the supply of material to be carted in accordance with the Road Board specifications, for the rural district council.—Mr. E. H. Cooke, clerk, Rural Council Offices, Wetherby, Yorks.

BELVOIR.—February 17th.—For the supply of materials and carting, for the rural district council.—Mr. R. J. Kettlebarrow, district surveyor, Normanton, Bottesford, Notts.

BEDS.—February 17th.—For the supply of broken granite, slag, flints, gravel, and cartage, for the county council.—County Surveyor, Shire Hall, Bedford.

BANBURY.—February 17th.—For the supply of best hand-picked and broken granite, for the rural district council.—Mr. H. Gauder; surveyor, Adderbury West, Banbury.

RUGBY.—February 17th.—For the supply of granite and carting, for the rural district council.—Mr. J. W. Pendred, clerk, Council Offices, Rugby.

HORSHAM.—February 17th.—For the supply of about 15,000 gallons of tar, for the rural district council.—Mr. W. Dengate, surveyor, 58 Park-street, Horsham.

THAKEHAM.—February 17th.—For the supply of broken basalt or granite, unbroken flints, and refined tar, for the rural district council.—Mr. W. Forrester, surveyor, Storrington, Pulborough, Sussex.

KINGSBURY.—February 17th.—For the supply of Leicestershire granite and granite chippings, ironstone slag, Derby limestone, broken pit or dug flints, hoggin, shingle cartage, and tar-spraying, for the urban district council.—Mr. R. C. N. Newport, surveyor, Council Offices, Kingsbury, Middlesex.

FORFAR.—February 17th–21st.—For quarrying and carting breaking materials for the highways, for the Forfar district.—Mr. A. Lindsay, 12 Reform-street, Kirriemuir.

SOUTHAM.—February 19th.—For the supply of about 3,000 tons of granite and 250 tons of best blue broken slag, for the rural district council.—Mr. H. Pickering, surveyor, Pickering, Southam, Warwickshire.

WANSTEAD.—February 21st.—For the supply of cartage and team labour, for the urban district council.—Mr. B. Blewitt, clerk.

BOLSOVER.—February 21st.—For the supply of granite, limestone, slag, basalt, tarred limestone, tarred slag, refined tar, pitch, kerb, channel, sand, and stoneware pipes, for the urban district council.—Mr. J. F. Wardle, town surveyor, Council Offices, Bolsover, near Chesterfield.

BRIDGNORTH.—February 22nd.—For the supply of granite and slag, for the rural district council.—Mr. F. Richards, surveyor, Council Offices, Bridgnorth.

MARPLE.—February 23rd.—For the supply of granite macadam and chippings, Macclesfield macadam and chippings, 6-in. grit stone setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

ROTHERHAM.—February 24th.—For the supply of granite slag and tarred macadam, for the rural district council.—Mr. R. Bradbury, district surveyor, Imperial Buildings, Rotherham.

KEYNSHAM.—February 26th.—For the supply of granite slag, tarred macadam, and limestone, for the rural district council.—Mr. J. Johnson, district surveyor, Surveyor's Office, Keynsham, Somerset.

BREDBURY AND ROMILEY.—February 26th.—For the supply of setts, macadam, and other highway materials, for the urban district council.—Mr. Albert Plunkett, surveyor, Council Offices, Schoolbrow, Romiley.

CHESHIRE.—February 28th.—For the supply of macadam, tar-macadam, and chippings, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

CHESHIRE.—February 28th.—For the supply of refined tar, Tarvia, or Tarco, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

DORCHESTER.—March 2nd.—For the repair of the district roads for one year, for the rural district council.—Mr. J. J. Estridge, highway surveyor, Bleak House, Maumbury Way, Dorchester.

DURHAM.—March 3rd.—Tenders are invited for a second-hand No. 1 Smith hot-mixer plant for the making of tar-macadam.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

CHAILEY.—March 22nd.—For the supply of about 2,980 yds. of flints, 2,550 yds. of granite or other stone, and 60 yds. of gravel, for the rural district

council.—Mr. C. Patrick, clerk, Union Offices, West-street, Lewes.

Sanitary.

ROCHFORD.—February 12th.—For the removal of house refuse, for the rural district council.—Mr. W. H. Roberts, clerk, 40 Clarence-street, Southend-on-Sea.

LAMBETH.—February 12th.—For the use of a shoot, wharf, or jetty, and for barging away therefrom of refuse, for the borough council.—Mr. H. Edwards, borough engineer, Town Hall, Brixton Hill, London, S.E.

LEEDS.—February 13th.—For the supply of press filter-cloths at Knostrop sewage works, for the Sewerage Committee.—Sewerage Engineer, Great George-street, Leeds.

BLAYDON-ON-TYNE.—February 13th.—For the removal and disposal of refuse, for the urban district council.—Mr. R. Biggins, Council Offices.

ROTHWELL.—February 16th.—For the removal of refuse and the supply of team labour, for the urban district council.—Mr. E. F. Moorhouse, sanitary inspector, Council Offices, Rothwell, near Leeds.

DARLINGTON.—February 17th.—For the scavenging of certain parishes, for the rural district council. —Mr. G. L. Bowron, Union Offices, Darlington.

AYLESBURY.—February 17th.—For the collection of refuse, for the rural district council.—Mr. R. T. S. Stewart, sanitary surveyor and inspector, Council Offices, 21 Walton-street, Aylesbury.

LEWISHAM.—February 20th.—For the supply of horse hire and removal of house refuse, for the borough council.—Borough Surveyor, Town Hall, Lewisham, London, S.E.

SMALLTHORNE.—February 28th.—For scavenging the Packmoor area, for the urban district council.—The Sanitary Inspector, Smallthorne, Staffs.

Stores.

HALIFAX.—February 12th.—For the supply of materials for the tramways department, for the corporation.—Tramways Engineer, Tramways Offices, Skircoat-road, Halifax.

FINSBURY.—February 12th.—For the supply of scavenger brooms, paints, pitch, creosote, sand, ballast, and stoneware goods, for the borough council. —Borough Surveyor, Town Hall.

BIRMINGHAM.—February 12th.—For the supply of granite kerbs, setts, crossing stones, chippings, flags, paving bricks, wood-paving blocks, ragstone, limestone, tarred limestone, tarred roadstone, gravel, sand, slag, lias lime, Portland cement, and stoneware pipes, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor, The Council House, Birmingham.

BELFAST.—February 13th.—For the supply of earthenware sewer pipes, timber, slates, hardwood, iron castings, plumber's work, nails, iron and steel, paints, oils, glazing, mill furnishings, shovels, spades, graipes, buckets, scavenging brushes, glazed bricks, artificial flags, lime, pitch, felt, tar, sea sand, sea gravel, Lough Neah sand, cement, uniform clothing and hats, for the corporation.—Mr. Hector F. Gullan, superintendent of works, City Hall, Belfast.

CHELTENHAM.—February 14th.—For the supply of clothing, castings, disinfectants, electric light fittings, forage, household goods and sundries; ironmongery, indiarubber goods, lime, bricks and sand, lead pipe, sheet lead and block tin, oils, colours, Portland cement, stoneware pipes, tools, timber, wrought iron, steel and files, for the corporation.—Mr. J. S. Pickering, borough engineer, Municipal Buildings, Cheltenham.

RAWTENSTALL.—February 15th.—For the supply of road metal, earthenware pipes, gullies, timber, pitch, creosote oil, disinfectants, Portland cement (British), iron castings, local stone (flags and setts), workmen's tools, scavenging brushes, horse-shoeing, coal and coke, carting, and team labour, for the corporation.—Borough Surveyor, Town Hall, Rawtenstall.

HEREFORD.—February 17th.—For the supply of hauling, horse hire, sewer pipes, kerbs, blue bricks, cement, cast-iron gullies and pans, brushes and brooms, disinfectants, and cast-iron manhole covers, for the corporation.—Mr. R. Battersby, town clerk.

STOKE-ON-TRENT.—February 17th.—For the supply of various materials and goods for the year 1917-18. —Mr. E. B. Sharpley, town clerk.

STAFFORD.—February 17th.—For the supply of ironmongery, tools, timber, castings, water fittings, stoneware pipes, brooms, cement and lime, bricks, paving setts, road stone, and ironstone furnace slag, for the corporation.—Mr. W. Plant, borough engineer, Borough Hall, Stafford.

BETHNAL GREEN.—February 19th.—For the execution of works and the supply of ballast, sand, broomheads, disinfectants, horse hire, and ironmongery, for the borough council.—Mr. A. E. Darby, borough engineer and surveyor, Town Hall, Cambridge-road, Bethnal Green, E.

DONCASTER.—February 19th.—For the supply of roadstone and setts, kerbstone, flags, slag or furnace dross, tarred slag and limestone, pitch, creosote oil and refined tar, sand and gravel, drainage pipes, blue channel bricks, bricks, cement, brooms, paints, picks and shovels, oils, paraffin, cotton wastes, and disinfectants, for the corporation.—Mr. R. E. Ford, acting borough surveyor, Mansion House, Doncaster.

WIGAN.—February 21st.—For the supply of brooms and brushes, Portland cement and lime, common bricks, stoneware pipes and gullies, pitch, creosote oil, tar, manhole and gully grates, oils, paints, grit, setts, kerbstones, channel stones, flags, gravel, chippings, macadam, granite setts, kerbs, channels and crossings, floorcloths and dusters, for the corporation.—Mr. A. T. Gooseman, borough engineer and surveyor, Municipal Offices, King-street West, Wigan.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY.

9.—Town Planning Institute: Prof. S. D. Adshead on "Monumental Memorials and Town Planning." 6 p.m.

10.—Institution of Municipal and County Engineers: Meeting of Eastern District Executive, 92 Victoria-street, S.W., 3 p.m.

12.—Surveyors' Institution: Mr. Edwin Savill on "The Defence of the Realm (Acquisition of Land) Act." 5 p.m.

16.—Institution of Municipal and County Engineers: South-Eastern District Meeting, 92 Victoria-street, Westminster, 4 p.m.

19.—Junior Institution of Engineers: Mr. R. D. West on "Some Improvements in Dealing with Trade Wastes." 7.30 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1076) subject to later confirmation by letter.*

WANTED, an Experienced Engineering Assistant, capable of taking charge, under the supervision of the Engineer, of the staff employed in the preparation of the Parliamentary Plans and other necessary work for a large scheme of Water Supply in Ireland.

Application, stating age, experience, qualifications, salary required, and date when applicant could commence duties, together with copies of three testimonials, to be forwarded to Box 1,691, office of THE SURVEYOR, not later than 21st February, 1917.

No reply before 1st March will mean that the post has been filled. (3,294)

LISKEARD RURAL DISTRICT COUNCIL.

Highway Surveyor Wanted for the Duration of the War; ineligible for Military Service. State age, qualifications, and salary required. Applications to be sent to me, the undersigned, by 14th February, 1917.

A. DE C. GLUBB,
Clerk.

Council Offices,
Liskeard, Cornwall. (3,272)

SURVEYOR, INSPECTOR OF NUISANCES, AND COLLECTOR OF RATES (Temporary) wanted at once. Engagement will probably last for the duration of the war. Salary at the rate of £120 per annum. Write full particulars of experience and references to—

ALFRED JOHN WINTER,
Clerk to the Swaffham Urban District Council. (3,285

APPOINTMENTS WANTED.

YOUNG Sanitary Engineer, A.M.I.S.E., M.R.San.I., desires position as an Assistant Engineer or Manager. Corporation. Knowledge of surveying, levelling, road, drainage, structural buildings and reinforced concrete works.—Address, J. N. Briggs, 18 Nightingale-lane, Clapham, S.W. (3,297)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but it is impossible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of contracts. Such advertisements may, in cases of emergency only, be telegraphed (Code No. 1367) subject to later confirmation by letter.

COUNTY BOROUGH OF WIGAN.

The Corporation of Wigan are prepared to receive Tenders for the Supply and Delivery of the undermentioned Stores and Materials for the 12 months commencing 1st April next

Bitumen and Benzine.
Portland Cement and Lime.
Creosoting Blocks.
Stoneware Pipes, Gullies, &c.
Pitch, Creosote Oil, and Tar.
Manhole and Gully Grates.
Oils and Paints.
Grey Setts, Kerbstones, Channel Stones.
Ubers, Gravel, Chippings, and Macadam.
Granite Setts, Kerbs, Channels, and Crossings.
Lamp-posts and Brackets.

Forms of Tender, Specifications, and other necessary information may be obtained on application to the Borough Engineer and Surveyor, Mr. A. T. Goldsmith, Municipal Offices, King-street West, Wigan.

Tenders, endorsed "S and S.W. Stores," must be sent to me not later than Wednesday, the 21st instant.

The Corporation do not bind themselves to accept the lowest or any Tender.

WILLIAM HENRY TYRER,
Town Clerk.

Municipal Offices,
King-street West,
Wigan.
9th December, 1916 (3,292)

COUNTY COUNCIL OF DURHAM

TAR-MACADAM PLANT FOR SALE.

The County Council invite Tenders for a Second-hand No. 1 Smith Hot-mixer Plant for the making of Tar-macadam. The machine is complete with side feeders, is in good working order, and is capable of turning out 25 to 30 tons of tar-macadam per day.

The Plant which has been on hire to the Road Board, can be seen at Sutton Veny Camp, near Warminster, by appointment with Mr. C. Hancock, Surveyor to the Rural District Council, Warminster.

Offers (including dismantling and removal) to be sent to the undersigned not later than 3rd March 1917.

ALBERT E. BROOKES,
County Surveyor.

Shire Hall, Durham.
February 6, 1917 (3,296)

BEDFORDSHIRE COUNTY COUNCIL.

TENDERS FOR ROAD MATERIAL AND CARTAGE.

The Bedfordshire County Council invite Tenders for the supply of the following:—

1. Broken Granite.
2. Slags.
3. Flints.
4. Gravel.

And for the Cartage of Road Materials.

Particulars and Forms of Tenders may be obtained at the Office of the County Surveyor, Shire Hall, Bedford, on and after the 5th February, 1917.

Sealed Tenders, endorsed "Tender for Road Materials," or "Tender for Cartage," must be delivered at the County Surveyor's Office not later than 12 o'clock noon on Saturday, the 17th February, 1917.

Samples must accompany the Tenders for Road Materials.

The County Council do not bind themselves to accept the lowest or any Tender.

W. W. MARKS,
Clerk of the County Council.

Shire Hall, Bedford.
February 2, 1917. (3,291)

BREDBURY AND ROMILEY URBAN DISTRICT COUNCIL.

ROAD MATERIALS.

Tenders are invited for the Supply of Setts, Macadam, and all other Materials to be used on Highways during the six months ending September 30th, 1917.

Specifications and Forms of Tender, together with any further particulars, may be obtained from Mr. Albert Plunkett, Surveyor to the Council, Council Offices, School Brow, Romiley, and to whom Samples must be forwarded, carriage paid.

Tenders, addressed to "The Chairman of the Highways Committee," to be delivered at the Council Offices, Romiley, not later than 6 p.m. on Monday, the 26th day of February, 1917.

(By order)
ARTHUR BRIGGS,
Clerk to the Council.

Council Offices,
School Brow,
Romiley.
February 9, 1917. (3,295)

KEYNSHAM RURAL DISTRICT COUNCIL.

The above Council invite Tenders for the Supply of Granite Slag, Tarred Macadam and Limestone, delivered to the various Stations and Wharves in the District for the year ending March 31, 1918.

Forms of Tender and Specifications can be obtained from the undersigned.

Tenders, endorsed "Supply of Road Material," are to be delivered to F. G. Whittuck, Esq., Clerk to the District Council, Keynsham, on or before Monday, the 26th February next.

The Council do not bind themselves to accept the lowest or any Tender.

J. JOHNSON,
District Surveyor.

Surveyor's Office,
Keynsham.
February 6, 1917. (3,293)

DISTILLED TAR
for spraying, grouting or macadam.
First-class uniform quality complying with the specifications of the Road Board.
BROTHERTON & Co. Ltd. LEEDS
WORKS—Middlesbrough, Stanningland, Wakefield, Workington

The Surveyor

And Municipal and County Engineer.

Vol. LI. FEBRUARY 16, 1917. No. 1,309.

Minutes of Proceedings.

Accidental Obstructions on Highways.

The recent case of *Hudson and Another* v. *Bray* (noted in another column) is of considerable interest to highway surveyors. It was an action for damages for personal injuries sustained by the plaintiffs, and injury to their motor car, by collision with a fallen tree belonging to the defendant, which was blown down during the night, in a gale, and fell across the road at a point where it passed through a deep cutting. From early morning until dark on the following day the road foreman of the county council and two of the defendant's men were engaged in trying to remove it, but without success. When it became dark, the defendant's men left the place, intending to bring a light, and during their absence the plaintiffs drove along the road in their motor car and the accident occurred. The judge of the Bishop's Stortford County Court held that the defendant had been guilty of negligence in omitting to light or guard the obstruction, and gave judgment for the plaintiffs. But he was overruled by the King's Bench Divisional Court on the ground that, although the defendant might have been guilty of "wilful obstruction" under sec. 72 of the Highway Act, 1835, in the event of his failing to remove the tree after notice from the highway surveyor he was under no obligation either to light or to guard it pending its removal.

This decision, taken in conjunction with the *dictum* of the court as to "wilful obstruction," suggests two questions. In the first place, could the defendant have been compelled to remove the tree? It will be remembered that under sec. 26 of the Act of 1835, "if any impediment or obstruction shall arise in any highways from accumulation of snow, from the falling down of the banks on the side of such highways, *or from any other cause*," the highway authority must, within twenty-four hours after notice from a justice of the peace for the county, cause the same to be removed. We believe we are right in saying that there is no express provision in the Act empowering the authority to require a landowner to remove an accidental obstruction. The *dictum* of the court, above referred to, however, is supported by the case of *Gully* v. *Smith* (12 Q.B.D., 121). In that case a highway passed through a deep cutting, and the adjoining land was supported by a retaining wall, a portion of which (owing to the exceptional wetness of the season and the pressure of the bank) subsided and fell on to the road, forming a dangerous obstruction. The highway surveyor gave notice to the landowner to remove it, which, however, he failed to do. He was then summoned, under sec. 72 of the Act, for "wilful obstruction" and convicted, the conviction being affirmed on appeal. But we do not think it would be safe to rely upon this decision as a precedent in every instance of an obstruction caused by accident. There is an obvious difference, for instance, between the fall of an artificial construction, such as a retaining wall, and the uprooting of a tree by natural causes. Moreover, it appears that in *Gully* v. *Smith* the wall was very badly constructed, and it is probable that this was an important factor in the case. In *Hudson and Another* v. *Bray* the court laid stress on the fact that the blowing down of the tree was an "act of God," for which the defendant was not liable. Moreover, it is to be noted that the *dictum* in that case was merely *obiter—i.e.*, not essential to the decision—and also that it is strictly guarded. The court did *not* say that the defendant *would* have been guilty of wilful obstruction had he failed to remove the tree after notice, but only that he *might* have been. The second question suggested is whether it was the duty of the highway authority to light or guard the tree. As we have seen, they would be bound to have it removed within twenty-four hours after notice from a justice of the peace for the county under sec. 26 of the Act. That section is silent on the subject of lighting or guarding the obstruction, and we are unable to cite any authority on the point, but we venture to suggest that it would be prudent for the authority to take all reasonable precautions against accidents pending the removal of the obstacle, whether any notice has been given by a justice of the peace or not.

* * *

An Important Statute.

The recently enacted Defence of the Realm (Acquisition of Land) Act, 1916, which empowers Government departments to purchase lands of which they have taken possession during the war, is a statute of far-reaching importance. Indeed, the comparatively limited amount of public attention which it has received is only due to the present overwhelming concentration on

matters which are directly connected with the immediate prosecution of the war. As Mr. Edwin Savill pointed out in the course of his excellent exposition at the last meeting of the Surveyors' Institution, the far-reaching consequences of the Act may be gauged from the fact that 150,000 acres of land have been taken over since the beginning of the war, and that the annual value of buildings acquired during the same period is approximately £2,500,000 sterling. The main object of the Act is to protect the State against the loss it might have incurred owing to the fact that buildings of various kinds erected on land belonging to private owners, possibly with valuable machinery attached, would in the ordinary course have reverted to the owners of the land. The first section of the Act provides for Government departments continuing possession after the war of lands of which possession has been taken during the course of the war or within the week immediately preceding its commencement. The period of continued possession is two years, or, with the consent of the Railway and Canal Commission, a further three years, making five years in all. Owners of property may be at some disadvantage, inasmuch as no provision is made for the occupying department at the termination of the war to give notice that occupation is to continue. Presumably, therefore, occupation will automatically continue unless and until notice is given determining it. Sec. 2 gives the occupying department the right to remove buildings or works erected for purposes connected with the war. The next section is probably the most important in the whole Act, for it deals with the purchase of land, and, unlike the preceding sections, which come into force only on the termination of the war, it came into force immediately on the passing of the Act.

One or two of the later provisions of the Act have a special interest for municipal engineers. For example, sec. 6 (3) provides that, where under powers conferred upon the military authorities any public highway has been closed, it may not remain closed after the expiration of twelve months after the termination of the war except with the consent of the Railway and Canal Commission, who, before giving such consent, shall hear the public authorities interested. The provisions of sec. 7, too, are worthy of note, for it deals with water and lighting, and under certain conditions allows companies to continue to supply outside their areas. Sec. 11 deals with streets, buildings, or works which are contrary to the provisions of local by-laws, and under it the local authority has power by order to cause alterations to be carried out to make the buildings comply with the by-laws or to order their removal after they have passed into private hands. The owner, however, has the right to appeal to the Local Government Board. It is impossible in the limited space at our disposal to do justice to the Act as a whole. Enough has been said, however, to show that municipal engineers should study its provisions, and in doing so they can hardly hope for a better guide than is afforded by Mr. Savill's excellent paper.

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American Roads.

In 1904 the American Office of Public Roads adopted the policy of conducting at five-year intervals an investigation to determine the mileage of improved and unimproved roads in each State, the expenditure for road purposes, and other related data. The importance of such an investigation in a country large tracts of which are still in a comparatively early stage of development can hardly be over-estimated, and the department are certainly acting wisely in pursuing the matter in spite of many difficulties. The nature of these difficulties is apparent from the report of the 1914 investigation, a copy of which is before us. It appears that in many places the records were found to be so indefinite or so incomplete that the most careful investigation failed to determine even the bare total of what funds had been expended on roads and bridges during the previous years. Lack of definite data and records by the local sub-divisions was found to be even more pronounced as to road mileage. Hundreds of instances were discovered where the local officials could give no more than a rough estimate, as maps had not been prepared or measurement of the roads been made. The tables comprised in the report show some striking comparisons between the figures for 1904 and 1914. For example, the total revenue applied to roads and bridges in the various States has been increased from about 80,000,000 dollars in the former year to 240,000,000 dollars in the latter, the precise percentage increase being 201·75 for the ten-year period. One of the most interesting tables is that which shows the relation of road and bridge revenue to mileage, area, population, and assessed valuation, 1914 and 1904. From this it appears that, while the revenue available for road purposes increased from $37·01 per mile in 1904 to $98·22 per mile in 1914—an increase of 165 per cent.—the actual financial burden upon the taxpayers did not increase in the same ratio. This was due to the fact that property values increased during the same period to such an extent that, whereas the average tax burden per $100 of assessed property value was 23 cents in 1904, it had increased to only 35 cents in 1914, an increase of 52 per cent, or less than one-third the rate of increase in the road fund. Another table shows the total and surfaced mileage of roads in the various States on January 1, 1915, with comparative information for 1904 and 1909. On the date mentioned there was in the United States a total of 2,445,761 miles of road, of which 257,291·54 miles, or 10·52 per cent, were surfaced. This does not include the streets in incorporated cities and towns. By comparing these figures with those obtained in former investigations, it appears that between 1909 and 1914 66,824 miles of road were surfaced. The general result is that great progress in highway construction and improvement is shown to have been made during the past decade—progress which reflects the general prosperity of the country.

* * *

The Royal Institute of British Architects and Civil Life.

It is a good thing to get and keep in touch with realities, and it is therefore a welcome sign to find the Royal Institute of British Architects taking a new departure in its professional outlook. Recently Prof. Lethaby submitted for the consideration of the members of the institute "Architecture and Civilisation," the keynote of which may be crystallised in the following pregnant sentence—viz.: "They thought in words and talked of architecture and fine designs, and style in art, and so on, but they did not seem to notice with their eyes how little of things they got in the real streets of the real towns they knew." Of course, Prof. Lethaby does not impute to his professional brethren a lack of ordinary observation, and that would not be in accordance with patent facts. What he seems to suggest is that, while among them observation and criticism are extensive, they fall short of the power of translating these qualities in terms of the realities of life as we know and live it. Thus we find him insisting that professionally architects need a sense of citizenship, of public order, of national spirit. This is a common enough reproach, for, unfortunately, most of us lack the idea and the spirit of the only true citizenship that counts. But the worthy professor was addressing his fellows, and with commendable courage he told them plainly that they needed these things for themselves, "and he ventured

to say the institute needed a collective outlook and purpose. It should be more than a large group of people of one calling; it needed to become the faculty of that part of civilisation which was concerned with planning and building." How was this to be achieved? Prof. Lethaby did not confine himself to generalisation, but instead proceeded to lay down a series of definite propositions which he appealed to architects to think out for themselves, with the object in view of arriving at basic facts and utilising these for the advancement of the civic life. The institute, he argued, should concentrate on a positive constructive policy, directing its education to the same end as the public welfare. Prof. Beresford Pike, who joined in the subsequent discussion, crossed the t's and dotted the i's of the opener's contention by remarking that it was for the members of the institute as artists to throw themselves into the movement for civic reform, "and break down the distinction which existed between the Royal Institute of British Architects and the municipal engineer and surveyor." It is one of the significant and helpful signs of the times that such a discussion as this should have been initiated, and we are hopeful that it may bear good fruit in due time. At all events, it is not to be allowed to stop here, for on the motion of Mr. H. V. Lanchester it was agreed to convene a further meeting to consider the course of action to be taken to give effect to the views enunciated.

* * *

The County Councils Association.

The annual report of the County Councils Association for 1916, which has just been issued, shows, as might have been expected, some limitation in the normal activities of that body in consequence of the prevailing war conditions. On the other hand, some new activities have been undertaken in consequence of the increasing recognition and appreciation of the assistance which can be rendered by local authorities in the administration of internal affairs and the consequent tendency towards greater decentralisation. Our readers will probably be most interested in that part of the report which deals with roads and vehicles. It will be recollected that the Treasury Retrenchment Committee, reporting with regard to the Road Board, recommended that the proceeds of taxes earmarked for the service of the board should be retained in the Exchequer during the war. This recommendation was acted upon, and it was further intended to make no distribution of the accumulated funds in the hands of the board. However, the latter question was re-opened at the request of the association, and witnesses were heard by the committee in support of the contention that some part at least of the accumulated funds should be used for the purposes for which they were originally intended. The Retrenchment Committee ultimately withdrew their previous decision, and in their Final Report recommended that such advances be approved by the Treasury as are in their opinion and that of the Road Board required in order to prevent serious deterioration of roads of real importance. In pursuance of this recommendation it was agreed that, during the financial year 1916-17, new grants or loans for road crust improvements, to an aggregate sum not exceeding £200,000, might be made out of the surplus to the credit of the Road Improvement Fund.

Reference is also made in the report to the clause in the Local Government (Emergency Provisions) Act, which prohibits the establishment of new omnibus routes, except under certain conditions. Other important matters with respect to damage to highways are, however, in suspense. Thus, the Departmental Committee on Locomotives and Heavy Motors (Damage to Roads) has not yet been able to present its report, while the Joint Select Committee on the subject of the liability of motor omnibus companies to contribute to the cost of road maintenance has not yet been appointed. It seems that these questions, which were hitherto regarded as being of pressing importance, will have to wait for consideration until after the war.

* * *

Road Openings in United States.

In another column will be found an article from the pen of Mr. Arthur H. Blanchard, in which he discusses the reasons for the present unsatisfactory status of road openings in many municipalities of the United States. The question is one which not infrequently gives rise to difficulty in this country, owing to interference with the surface of roads by companies using their own men. In America the practice is by no means uniform. Indeed, according to Mr. Blanchard, it varies from absolutely no control by any city official to a thoroughly organised administrative supervision. An example of the latter is afforded by one city in which an enactment is in force by which all corporations owning pipes or mains were required to deposit with the city authorities a map showing the exact positions, sizes, and descriptions of all their mains, and, further, to deposit a corrected map at the beginning of each succeeding year. Again, there is considerable diversity of practice in regard to the repair of openings. In some cases the full responsibility for reinstatement is imposed upon the company breaking up the street, while in other districts the filling in and repairing are done by the Commissioner of Public Works. Experience in this country leads to the conclusion that the only really satisfactory method of dealing with the opening of roads by public companies is for them to be reinstated by the local authority. Even so, trouble not infrequently arises from inefficient filling in of trenches and the consequent subsidence of surfaces. The position is much worse, however, if companies themselves are allowed to repair road surfaces, for this practice inevitably results in patchiness and inefficient work generally. The comparison which Mr. Blanchard enables us to make between English and American practice in this matter is both valuable and interesting.

* * *

Pig-keeping.

Apropos of our recent remarks as to the desirability of securing some efficient local control over the construction of pigsties, it is interesting to notice the terms of a regulation which has been made at the instance of the Local Government Board with a view to increasing the national food supply by encouraging the keeping of pigs. The regulation provides that, with a view to maintaining the stock of pigs in the country, any local authority by whom a by-law has been made which is for the time being in force prohibiting, restricting, or regulating the keeping of pigs, may grant permission, either generally or in particular cases, to keep pigs, notwithstanding or contrary to any provisions of any such by-law, *subject, however, to the observance of any directions of the local authority in the interests of public health.* The italics are ours. We feel that at the present moment every effort towards the increase of the food supplies of the country is a matter of cardinal necessity. At the same time, however, it will, we are sure, be generally agreed that there shall be no avoidable risk to the public health. That there would be such risk with the indiscriminate and uncontrolled keeping of pigs goes without saying, and it is therefore very satisfactory to see that the Local Government Board in framing their regulation have definitely empowered local authorities to give such directions as may be necessary in the interests of the public health.

Road Openings.

UNITED STATES PRACTICE AND REGULATIONS.

By ARTHUR H. BLANCHARD, Consulting Highway Engineer, New York.

The present unsatisfactory status of road openings in many municipalities of the United States is due to one or more of the following contributing causes: (1) Lack of centralised administration; (2) inadequate supervision by highway departments; (3) utilisation of inefficient organisations and methods for backfilling trenches, making temporary surface repairs, and final replacement of artificial foundations and pavements.

ADMINISTRATION AND ORGANISATION.

Present practice in administration and organisation governing road openings varies from absolutely no control by a city official to a thoroughly organised administration, such as is found in the cities of Cincinnati and Philadelphia for example. In Cincinnati it is unlawful for any person, firm, corporation, or city department, other than the Street and Sewer Repair Department of the Department of Public Service, to make openings unless a permit is obtained. Philadelphia, with its perfected organisation of experienced engineers and inspectors under the Permit Division of the Bureau of Highways, has an efficient workable plan of control which is worthy of investigation and duplication.

Lack of knowledge of subsurface structures in the majority of municipalities is recognised by municipal authorities. Recently endeavours have been made in several municipalities to remedy this condition. The practice of the borough of Brooklyn, of New York City, Philadelphia, and Houston, Texas, are cited as examples. In Houston all persons, firms or corporations owning pipes, &c., were required to file with the city, within ninety days after the passage of the ordinance, a map on a scale of 200 ft. to 1 in., which showed the exact position, size and description of its mains, laterals, and other subsurface structures; and, furthermore, in each year, within fifteen days after January 1st, a corrected map, or set of maps, must be filed.

In many cities it has become the practice to post notices on highways to be paved or repaved, and to forward such notices to all property-owners residing on streets to be improved, and to persons, corporations, and city departments who control subsurface structures on such streets.

The ordinance of the City of Cincinnati states that no permits will be granted within a period of three years after the construction of roads, except on account of emergencies.

PERMITS AND PAYMENTS FOR RECONSTRUCTION.

Practically all municipalities with over 50,000 inhabitants require some form of permit of a person or corporation desiring to make an opening in a road. In many cases, however, the securing of a permit is a mere formality, as in the case of one municipality of 250,000 inhabitants, whose ordinance only requires for the permit a payment of $2, and notice, in writing, to the Commissioner of Public Works that an opening is to be made. On the other hand, several municipalities require compliance with definite and adequate regulations. As an example, the following excerpts from the ordinances of Pittsburgh are mentioned: The application for a permit must contain a complete detailed description covering position, size of openings, nature of substructures, &c., a bond of $500 for one opening, and $2,000 for an indefinite number of openings must be filed, a deposit to cover the cost of repaving must be made.

The amount of deposit required with a permit varies to a remarkable degree. Some municipalities have adopted a logical basis of charging the cost of repaving plus a certain percentage for inspection and other overhead charges. In the case of the City of Seattle, where all repairs, after the trench is opened, are made by department men under the direction of the Superintendent of Streets, a deposit is required based on the following rates: $2 for each cubic yard of earth filling; $5 for the first square yard of pavement, $3 per square yard for each additional square yard broken up upon the basis of a signed statement by the Superintendent of Streets, the city treasurer pays back unexpended part of deposit, retaining 10 per cent. of actual cost for overhead charges; a utility company may, however, deposit $500 for cost of repairing street openings and renewing same as required.

It should be noted that many cities have adopted a schedule of rates of repaving dependent upon the kind of artificial foundation, the type of road, and the yardage of opening. For example, Schenectady, New York, makes the following charges for artificial foundations and road surfaces: Asphalt, brick, or granite block, $10 for the first square yard and $3 for each yard thereafter; for macadam, $3 for the first yard and $1 for each yard thereafter.

In this connection it has been recommended, in the case of Richmond, Va., that the ultimate cost of installation of lateral connections by public utility companies would be materially reduced if all lateral connections, the usefulness of which could be predicted, were made prior to the time when the street was paved or just before a street was repaved.

BACKFILLING, ARTIFICIAL FOUNDATIONS, AND REPAVING.

Great variation is found in the practice of American municipalities with reference to making repairs of openings by city departments, contractors, or public utility companies. In some cases all repaving work is done by the permittee. In Albany, for example, public service corporations open, backfill, and repave, while in other instances backfilling and repaving is done under the direction of the Commissioner of Public Works. Many municipalities allow the permittee to open and backfill, artificial foundations and road surfaces being constructed by city departments. In a few instances, as in the case of Seattle, the city does all the work with experienced men, the result being that openings are repaired in an efficient manner, and very little trouble results thereafter. It is well to note that the public utility companies of Seattle appreciate having the work done by experienced employees of the municipality, thus relieving them of responsibility in connection with repairs.

Inefficient control and methods of backfilling are the cause of a very large percentage of the troubles arising from road openings. Even with the accumulated knowledge and experience now at hand, many municipalities to-day allow backfilling to be made by the inefficient method of merely shovelling in as much material as the trench will hold. Advanced methods of backfilling are, however, in use in many municipalities where it is required that all material excavated, except rock, shall be placed in the excavation, thoroughly tamped in layers of from 3 in. to 6 in., or flushed if the materials and other conditions are suitable for this method of compaction.

Houston, Texas, goes a step further, and requires that trenches under pavements shall be refilled with well-rammed gravel, broken stone, or brickbats, or refilled with tamped earth and covered with a reinforced concrete (1:2:4) slab, which must project 12 in. on each side of the trench, and have a depth of 10½ in. for a 2-ft. opening, increasing to 15 in. for a 6-ft. opening.

Ottawa requires the construction, in addition to the regular foundation, of a reinforced cement-concrete sub-foundation, 4 in. in thickness, which extends back 4 in. on each side of the trench.

In several municipalities it is required that the cement-concrete foundation shall be cut back for 6 in. on all sides of the opening, and be replaced by new cement-concrete, thus forming a slab to bridge over the trench.

CONCLUSIONS.

Based on observations of practice in many municipalities throughout America and Europe, the following conclusions are submitted as applicable to general conditions found in municipalities throughout the United States:

Administration and Organisation.—Road openings should be absolutely under the control of the chief of the Bureau of Highways; all persons, corporations, and other city departments being required to secure permits from the Highway Department prior to making openings in roads, except

where emergency conditions require such openings to be made in the interests of public health and welfare. Notices should be advertised, posted, and sent to all interested parties, giving ample warning—in cases where streets are to be paved or repaved, and containing the provision that charges to the permittee will cover cost of backfilling, but not artificial foundations and road surfaces. The practice of not allowing road openings to be made within a certain period after a pavement is laid is believed not to be in the interest of public progress, and is unnecessary if the notice advocated is given, and efficient methods of control, backfilling, and repaving are adopted. Plans of subsurface structures on all streets should be compiled, and permits should be granted only after accurate and detailed information has been filed pertaining to all details of substructures in connection with the given road opening. Deposits should be required covering cost of backfilling, reconstructing artificial foundations, and repaving, which should be based on a schedule of rates dependent upon the character of backfilling, type of artificial foundation, kind of road, and yardage of the several items. An adequate percentage should be added to the cost of the above items to cover supervision and other overhead charges. After a permit has been granted excavation should be made by the permittee, and backfilling and repaving done under the supervision of engineers of the highway department and by a flying squadron of experienced men in the employ of the department.

Backfilling and Artificial Foundations.—All material excavated, except rock, should be replaced in the trench, and, in the process of backfilling, the material should be thoroughly compacted by hand or mechanical tampers, or with the aid of water used sparingly, dependent upon the character of soil and kind of pipes. Except in the case of waterbound gravel and broken stone roads, cement-concrete foundations over trenches should be constructed, and such foundations should extend 6 in. beyond each side of the trench, and have a depth of not less than 8 in. If the methods outlined above are adopted, it is not necessary to postpone repaving, provided climatic conditions are satisfactory for such work. If temporary repaving is, for any reason, necessary, it is recommended that the backfilling, as above outlined, be carried to the elevation of the top of the artificial foundation, and that such materials as small stone blocks, paving bricks, laid flat, asphalt block seconds or hot or cold bituminous concrete should be used for a temporary wearing course.

Repaving.—In the process of repaving it is recommended that the old pavement be cut back 3 in. on each side of the new cement-concrete foundation. The adoption of this plan will eliminate planes of weakness, and will ensure the practicability of making an efficient bond with the old pavement.

Footpaths.—The ground beneath footpaths in municipalities should be kept clear of vaults and other accessories of buildings. The space under footpaths should be reserved for the possible future installation of pipe systems, which would relieve present congestion of subsurface structures in the carriageway and reduce the number of openings made in roads.

Remedy for Cellar Flooding.—The cellar under the Essex County High School, at Walthamstow, has given much trouble owing to being constantly flooded. After much expense in trying various means to keep the water away, it was decided to put down a further 2-ft. of concrete, and to use a wall pump periodically. Water still percolated into the cellar, and the county architect then decided to use Pudloed cement concrete. We understand this last-mentioned treatment has resulted in the cellar being made perfectly dry.

Householders and Refuse Destruction.—Following an appeal to the inhabitants to burn their refuse, the amount of material placed in the Leeds dustbins was reduced by 19·8 per cent in a period of several weeks, and the saving in the cost of collection was no less than £16 per day. A test analysis of the refuse collected recently showed that in a working-class district combustible material formed only 25 per cent of the whole, but that in three other districts the percentage was 50. The appeal to householders is therefore to be made again, with the hope that the response will be as good, or better, and more lasting than before.

COST OF TEAM LABOUR.

CRIMSBY FIGURES.

Carting contractors who work for the Grimsby Corporation applied to the Highways Committee last week for an advance of 2d. per hour upon their present rate of 1s. 2d. per hour for team labour.

In a letter from the contractors it was pointed out that oats had risen from 21s. to 54s. per quarter; maize from 18s. to 73s.; and oat straw chaff from 45s. to 90s. per ton.

The chairman of the committee (Alderman T. C. Moss) said that the corporation were at present paying contractors £3 3s. per week of fifty-four hours, yet the cost of a fifty-one hours' week's work by their own employees was £2 17s. 1½d., and he doubted very much if any contractor leading for the corporation paid his men as well as the corporation paid theirs. Yet, after making allowance for the life of a horse at eight years, cost of stabling, shoeing, medicines, and so forth, and paying the men 6½d. per hour, with a 4s. weekly war bonus in addition, the corporation could do the work at some 6s. per week less than the contractors now were paid.

Councillor Thicket asked if capital cost of vehicles and harness and wear and tear of tools were considered in the corporation figures.

The borough surveyor (Mr. H. Gilbert Whyatt) said the contractors used corporation carts and appliances to a great extent.

The chairman: And, anyway, there's a margin of 6s.

Councillor Womersley suggested that the contractors should be asked to furnish a list of wages paid to their men before the matter was considered further, and Councillor Fletcher remarked that the cost of horse food had been quoted, but not the wage rate.

The committee decided that they could not consider the matter on the present details.

MOTOR 'BUSES AND EXTRAORDINARY TRAFFIC.

CONTRIBUTIONS FOR WEAR AND TEAR.

At a meeting of Denbighshire County Council on Friday last Mr. R. B. Adams submitted the results of inquiries he had made as to the effect of motor-omnibus traffic upon the main roads. He called attention to the judgment given in the Court of King's Bench to the effect that motor-omnibus traffic comes within the Extraordinary Traffic Act, and that compensation may be recovered for damage done to roads by such traffic.

Mr. Gomer Roberts suggested that the county council should make an agreement with the motor-'bus proprietors for contributions from them, instead of claiming under the Extraordinary Traffic Act.

Mr. T. J. Matthews pointed out that the main roads in the urban areas were being used for motor-omnibus traffic. He asked whether anything was being paid by the 'bus proprietors in respect of that traffic.

The clerk said that the main roads were under the control of the urban authorities, and the county council contributed towards the cost of their maintenance. The contribution usually made took the form of the full cost.

Mr. W. G. Dodd said he thought there was a good deal in the point made by Mr. Matthews. The county council was being called upon to repair the damage done by motor omnibuses on urban main roads, and if the county council were to make bargains in respect of 'buses which ran into the country the same thing should apply to the traffic in urban areas.

On the motion of Mr. Matthews, the county council decided to request the urban authorities to claim contributions from motor-omnibus proprietors in respect of wear and tear by their vehicles of main roads in such areas.

Assistant Surveyor's Exemption.—Conditional exemption has been granted by the local tribunal to the assistant borough surveyor of a Northern town, passed in B3, who was said to be engaged in the preparation of schemes which it is intended to carry into effect at the conclusion of the war.

Monumental Memorials and Town Planning.*

By Prof. S. D. ADSHEAD.

From the remotest ages it has been the custom of man to memorialise by symbolic representation in ivory, bronze, and stone epoch-marking events. It is to the utilitarian patriots of last century that must be credited the discovery that a memorial could take the form of a hospital or similar useful institution. I have heard of a small Urban Council who, with an eye to thrift and economy, decided to commemorate the Jubilee of Queen Victoria by the construction of a new public sewer. Needless to say, it is not with such memorials that I am concerned.

It is generally recognised that monuments which have been erected in this country during recent years have suffered very much from the lack of a good setting. These things are better understood in France. What is the reason? In Paris, streets and avenues have for the most part been designed. Their angles and junctions are symmetrical, and monuments placed therein take their place quite naturally. There have been times during the growth of London, and to a less degree that of the provincial towns, when streets and squares were laid out similarly. But for the most part our English towns have no composition, and only the cohesion seen in a motley crowd, where every individual is seen pushing his interest in his own way. Under such circumstances monuments cannot be said to fit their sites in an orderly way. They either occupy odd corners or odd junctions of streets, and under our existing system of administration their arrival is as often unexpected as their site is unprepared. So that the general public, or at any rate that section of it who are interested in such matters, are under a constant apprehension as to when and where a monument is to be expected next.

Public Authorities and Art.

Of all public undertakings, the placing of monuments is one that ought certainly to be referred to the general body of town planners, architects and sculptors. We are a democratic nation, and possibly we may soon find ourselves in the position of a very strong democracy. In the matter of the design and placing of public monuments we are entirely in the hands of the public authorities, who have not as yet distinguished themselves in the production or discovery of artistic genius, or else we are at the mercy of some well-meaning though untutored philanthropist who has money to spend. There are places in London and also in our provincial towns where monuments can be part of a civic composition take their place, but in most cases they can never do more than fill a gap. Monuments in towns require prepared architectural sites.

In the best examples of civic design the monument and its surroundings have been considered together. It would, of course, be impracticable, and in most cases quite impossible, to put a new façade to the buildings that surrounded every important monument. But it is almost a platitude to say that they ought to be designed together. As a matter of fact, every building to-day is designed as a frontispiece. Nobody cares to spend money on backgrounds. The result is we get no civic compositions, and never will do, unless our democracy becomes so strong as to recognise that there are chosen moments when the individual must bow to the dictates of an autocracy. It is an open question whether after the war with the democratic spirit that prevails in this country and its impoverished conditions, the national inclination will be in favour of spending huge sums on one or more national monuments, but it is quite certain that monuments costing, say, from £5 to twenty thousand pounds will be erected not only in London but in every provincial town. If these are to be placed to the best advantage it is of the greatest importance that consideration be given to the question of site.

After the death of Queen Victoria practically every town in England erected a statue to memorialise her reign. The best of the vacant sites were then appropriated, though perhaps not always to the best advantage. It was much more difficult to find a site for King Edward.

* From a paper read at a meeting of the Town Planning Institute on Friday last.

The Place de la Concord.

It would require a very lengthy research into history to understand how it is that we have fallen so far short of the success that has been attained as regards similar undertakings in other countries, and especially in France. In the days of the Louis, between the king and his artists there were connoisseurs like Le-Brun, and in the days of ducal influence in this country there was a much broader understanding of the arts on the part of those who controlled their practice, and a much closer intimacy between practitioner and patron than can possibly exist under conditions as they prevail to-day. Let us note, for instance, how Louis XV. laid out the Place de la Concord at Paris

Patte, who has produced a folio on this work, tells us with that punctilious flow of loyal utterance assumed by writers of the day that the towns of France, and especially Paris, desirous of expressing their attachment and loyal devotion to their sovereign, decided to erect statues to his honour. In Paris a great competition was inaugurated, each competitor being asked to suggest a site and its treatment. The competition resulted in the production of some seventy or eighty very ambitious schemes. His Majesty, after having examined them, seeing that it was not possible to put into execution a design without doing away with roads and sacrificing the convenience and interests of numbers of his subjects by the destruction of innumerable houses, and filled with generosity towards his people, made a present to the town of a large piece of land, now the Place de la Concord.

A further competition was held for a monument on this site. It is too long a story to follow the proceedings in detail, but ultimately none of the competitors received the commission of carrying out the design, the work being finally entrusted to Gabriel, the King's own architect, who made such use as he could of the ideas embodied in the competitive designs. There was no doubt much wisdom mixed with what in the light of to-day would be considered unprofessional practice in what was done, but it is a revelation to see the enormous importance that was attached to the preparation of a site for a piece of sculpture.

Trafalgar Square.

Here it may be of interest to note the circumstances that brought into being our own Trafalgar Square.

When Wilkins had completed his National Gallery, he was asked by the Commissioners of Woods and Forests to lay out Trafalgar Square. This was in the year 1837. He died however, when the work had hardly commenced, and the commission fell to Barry in 1840. But previously, on June 2nd, 1838, an advertisement was inserted in the "Times" by a Nelson Memorial Committee for a design for a Nelson Monument to be placed here, a site for the monument having been given by the Commissioners of His Majesty's Woods and Forests. The monument was to be erected out of funds obtained by public subscription. There were no conditions other than those contained in the advertisements, but one hundred and eighteen designs and forty models were submitted. After considerable delay and hesitation resulting from the incompetence of the judges, and their diversity of opinion, there being no professional assessor, and the holding of a second competition, the design of Railton for a Corinthian column was chosen. But there was still uncertainty as to the propriety of imposing so gigantic a column in the Square. A select Committee sat, and the evidence of every architect of distinction was obtained, including that of Barry, the architect of the Square. Barry was amongst those who disapproved of the column, his reason being that it would dwarf its surroundings. Others considered that the column was so important that this would not matter. Before a definite decision was arrived at, however, the businesslike Railton had one thousand pounds worth of concrete put in as a foundation, and there is no doubt, had it not been for Railton's insistence, the misgivings which were general would never have been overcome

RECONSTRUCTION OF WORN-OUT AREAS.

Let me remind you that one of the most important points to be observed in the design of the "public place" is that of preserving an unobstructed spaciousness. Our towns are rapidly increasing in size; they should also increase in scale and dignity.

Many of our provincial towns containing populations of 100,000 and more were but villages at the commencement of last century, yet in the matter of disposition they still retain their village character and practise village habits. We should see that greater dignity is secured, and more orderliness observed. Consider the intrusion of lavatory enclosures, cabmen's shelters, tool sheds, sand boxes, &c., that are everywhere allowed to obstruct and disfigure our public "places," and without any consideration whatever as regards their forming the details of a civic scheme.

We are living in an age of town planning and town improvements, and therefore I would impress upon those in authority in our provincial towns and boroughs the advantage of boldly adopting the policy of the French in the reign of Louis XV., even though as a democratic undertaking it may have to be carried out in a more modest way. I would suggest that, instead of searching the town for an odd corner that perchance may have been overlooked when the last search was made for a site for the Queen Victoria Memorial, a site be provided by the reconstruction of a worn-out area. Let every town of moderate size in England memorialise the part its heroes have taken in the war in the reclamation of a slum, in the erection of an up-to-date group of buildings either commercial, as shops, or domestic—preferably the latter; and in the centre, as a climax to the whole scheme, let it place its war memorial, which incidentally will form a token of the new interest in town life and create a real civic awakening.

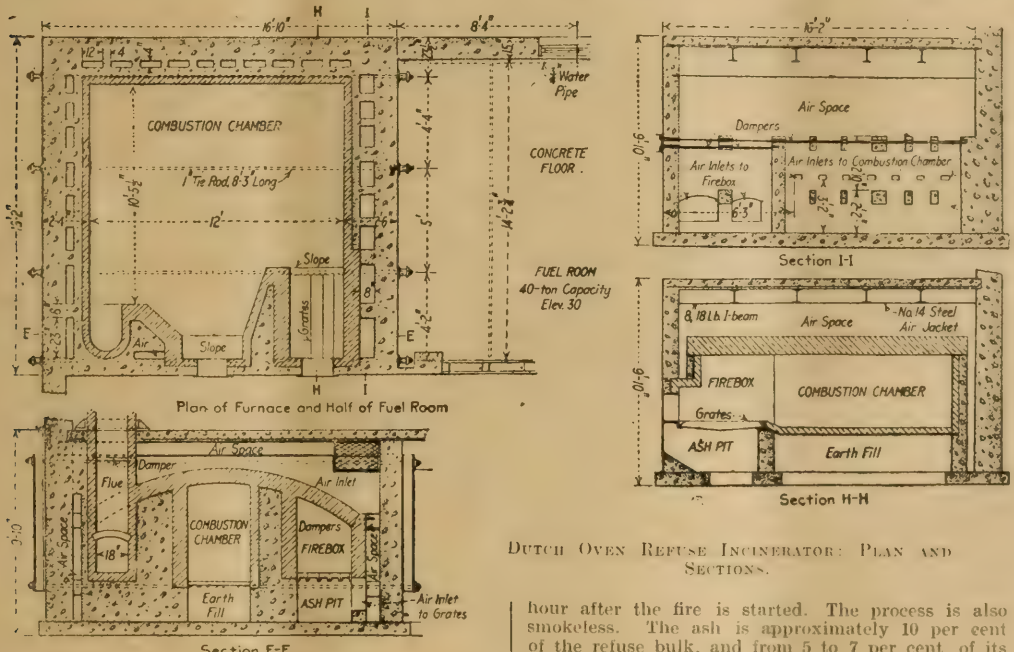
Women Motor Drivers. All the motor cars belonging to Edinburgh Corporation are in charge of the cleansing department, and were till recently driven by men. The men have, however, been called up, and in their place, as an experiment, Mr. Gibson, the superintendent, engaged women drivers. The drivers, it may be stated, are thoroughly acquainted with driving, and have come forward at this time from purely patriotic motives to "do their bit" in a position and sphere in which they are capable. The experiment has been most successful, the lady drivers having proved cautious, attentive, and reliable. Their uniform is a double-breasted blue overcoat, and their headgear a cap with the city arms on the front.

DUTCH-OVEN REFUSE INCINERATOR.

A refuse incinerator, consisting of two 10-ton Dutch-oven-type units, was recently put into use at Mason City, Iowa, and is described in *Engineering News* by Mr. Robert F. Gayton, the assistant city engineer in charge of the work of construction.

Each unit is 12 ft. by 12 ft. in plan and 4½ ft. high inside. The tops of the furnace form the floor of the second storey. The second storey covers but half the building and is the driveway and charging space. The building is 32 by 50 ft. in plan, built of tile, with a pebble-dash outside finish. The roof has a steel frame, and is covered with red asbestos shingles.

The furnaces were built under a patent (U.S. No. 1107615) held by Messrs. Jones Bros., Macon, Georgia. The flues are arranged to give a preheated air supply, so that 60 lb. of the average mine-run bituminous coal is expected to reduce one ton of city-run garbage. This city-run refuse consists of kitchen wastes, commercial wastes—including tin cans and bottles—all carcases, and night soil. The process is odourless at 1,000 deg. Fahr. and higher. The furnaces reach this temperature one-half hour to an hour after the fire is started. The process is also smokeless. The ash is approximately 10 per cent of the refuse bulk, and from 5 to 7 per cent of its weight. The smoke-stack, lined with firebrick, is 18 in. in diameter and 40 ft. high.



Dutch Oven Refuse Incinerator: Plan and Sections.

When the test of the crematory was made, several tons more refuse was consumed than the guarantee called for.

The refuse-collecting wagons discharge directly into the furnace. By the use of the underslung wagon a load is discharged in three minutes. It is rarely necessary to raise the temperature in the furnaces higher than 2,200 deg. Fahr.

The furnaces are in continual operation day and night. Each two weeks it is essential completely to burn out a furnace to clean out the flues, which is a simple matter.

The cost of the incinerator complete was £2,400. As a matter of interest it may be stated that these burning units can be installed singly, in pairs or in any number necessary, in accordance with the quantity of waste material to be consumed.

Hertfordshire War Bonus.—Hertfordshire County Council have decided that the salaries of certain members of the county surveyor's staff and of eight main road district surveyors should be increased by 20 per cent, such increase to be in the nature of a war bonus to commence on January 1, 1917, and to be in operation during the continuance of the war and for a period of six months thereafter.

SCOTTISH NOTES.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Scottish Notes," 24 Bride-lane, Fleet-street, E.C.]

Edinburgh Tramways.

In agreeing to take over the undertaking of the Edinburgh and District Tramway Company, the Edinburgh Town Council have for the present settled their "tramway question." It will be unfortunate should public money be spent in the perpetuation of the present system. From what can be gathered from the public Press, the Council seem to have decided that, as soon as [illegible] a clean sweep must be made. It next appears is to take place and new and profitable routes [illegible] must not be delayed longer than the state of war actually demands.

* * * *

Overhead traction seems likely to be adopted for the reconstruction, but there will not be wanting a strong party adverse to its introduction to Princes-street. It surely will not pass the ingenuity of tramway engineers to find a way out in keeping with the artistic associations of the street. The writer remembers the "wordy warfare" that took place in respect of the introduction of overhead equipment in Glasgow, conterminous to the stately mansions of Great Western-road, in George-square, and in the avenues of Pollokshields. Who to-day will be found to object with any serious objection to the overhead wires? Glasgow's system—of which the city is justly proud—is one of the finest and greatest in the world, and Edinburgh will not lose by following in the footsteps of its rival in the west.

* * * *

The Speculative Builder.

At a recent meeting of the Glasgow Property Owners' Association objection was taken to the tendency in recent housing conferences to ignore the speculative builder and to leave him out as a factor in the provision of housing for the working classes. The writer's feeling is there is room for the Trust, Council's Building Committee, the Building Society, and the speculative builder alike. The man who is prepared to give good work is not to be told "come again." Meantime, there is no encouragement to all private building enterprise. Apart from the Government's restrictions, dearness and scarcity of money, coupled with the great increase in the cost of materials and labour, make work impossible. The Glasgow Master Masons' and Bricklayers' Association, at their annual meeting the other day, viewed these matters in a hopeful spirit, and looked for a revival of their activities with the cessation of hostilities, the carrying out of town planning schemes and the many improvement proposals of the city council.

* * * *

Relaxation of Building By-laws and Cost.

In view of the high cost of building materials—which is bound to continue for a considerable time after war is over—what is the ruling likely to be adopted by the authorities in the provision of housing? Are the old methods to be adhered to, are we to continue to build in stone to our heavy rubbles, and provide expensive internal fittings and furnishings? Or are we to endeavour to have our building by-laws and the building conditions of the Burgh Police Acts so revised that construction such as is being adopted in Manchester, Bradford and elsewhere will become possible and general? There are objections to be met in the newer methods. We are told the construction is too light and not suited to Scotland. Have our former methods not been too heavy, and is it not time we began to judge of their suitability to Scotland? An English surveyor of considerable standing has recorded to the writer, "In England we build for a lifetime, in Scotland we build for all eternity."

* * * *

A Scottish general contractor in [illegible] the cause of the difference in cost of house building in England and Scotland. Various reasons were given as militating against favourable results—particularly in Glasgow and the West—the price of land, the costly form of road construction demanded, the methods of building construction, and the tendency to overdo internal adornment. At the same time a plea was put forth for a simpler construction. The matter has not been lost sight of, and Scottish surveyors are particularly alive to the need of reviewing and revising the present methods. The next report of the Scottish Branch of the Institution of Municipal and County Engineers will doubtless be of interest in this respect.

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1916 Rainfall.

At the risk of anticipating "British Rainfall," a few statistics, which the writer has been able to obtain in regard to the rainfall for 1916, may be of general interest; they at least indicate an abnormal rainfall. At Glendevon and Carnock, where records have been kept for over thirty-three years, no higher rainfall has been recorded, and the last year's figures are some 17 in. over the "mean":—

	Altitude. Feet.	1916. Inches.	1915. Inches.
Glendevon (waterworks) ...	945	77·78	56·74
Carnock (Craiglusear) ...	280	50·27	37·50
Devon Valley (Blairingone)	296	52·58	40·47
Auchterarder (Bellhe) ...	100	41·26	31·43
Dunfermline ...	365	48·79	35·36
Cowdenbeath	473	56·65	43·35
St. Andrews (waterworks) ...	200	38·85	32·68
Arbroath (Muirheads) ...	251	38·06	27·65

CAPE TOWN MUNICIPAL WORK.

NEED FOR COMPREHENSIVE SCHEME OF ROAD RECONSTRUCTION.

In his report, covering the year ended June 30th last, Mr. D. E. Lloyd Davies, M.Inst.C.E., the city engineer, states that, like other important centres, Cape Town is passing through a difficult period in regard to main roads. "The great increase in motor traffic," he says, "calls for a much more modern and expensive type of road than that which sufficed until a few years ago, but no marked improvement can be looked for until a comprehensive scheme of reconstruction is undertaken."

Concrete proposals had been laid before the council, but, unfortunately, funds have not been found to finance the scheme so far. "It is patent," observes Mr. Lloyd Davies, "that much money will be wasted in continual repairs, and that considerable inconvenience will be experienced until definite action is taken."

The condition of the secondary roads, as a whole, is improving. Notwithstanding the very high prices of materials and ever-increasing mileage, the expenditure on road maintenance has been kept within the comparatively restricted amounts voted.

TOWN PLANNING.

The city engineer mentions that a comprehensive report on town planning was presented to and adopted by the council, and regulations to enable the development of new estates to be properly controlled have now been framed. Measures are being taken to obtain further powers that will be required before a town planning scheme for the whole area can be undertaken.

STREET WATERING.

During nearly the whole of the summer there was a great scarcity of fresh water, and salt water was therefore used most exclusively for street watering.

All important and busy thoroughfares were watered at least twice daily, and those subjected to the heaviest traffic were watered three and four times daily, when necessary.

SANITARY SERVICES.

At the beginning of the year this branch of the work was thoroughly overhauled, and an improved method of working was introduced. The practice of effecting removals in the day-time was discontinued and a better supply of pails provided. The satisfactory results attained may be gauged by the fact that the number of complaints, which in the first three months amounted to 194, sank to nine in the last three months.

Recent Practice in the Purification and Softening of Public Water Supplies.*

By FRED. C. UREN, M.INST.C.E.I., Surveyor to the Aldershot Urban District Council.

(Conclusion.)

Closely allied and frequently auxiliary to filtration proper are the processes for the destruction of algæ and pathogenic bacteria, and in recent years many experiments have been made with various methods of sterilisation in order to satisfy the demand for a bacteriologically pure drinking water. The three methods which have been adopted are: (1) Chemical sterilisation; (2) ozone; (3) chlorine.

In the first method either chloride of lime or chloride of potash is used in sufficient quantity to destroy bacteria.

Ozone.—The application of ozone to the sterilisation of partly purified water supplies has been largely exploited on the Continent.

There are many devices for ozonising air, which commences when the tension reaches about 10,000 volts, most of them being adaptations of the Siemens ozoniser, familiar to all students of physics—*e.g.*, the De Frise apparatus, the Otto process, the Siemens-Halske, the Vosmaer, and the Howard-Bridge. The sterilising tower is generally about 25 ft. high by 3 ft. diameter, and is enamelled on the inner surface to avoid corrosion. At various points in the steriliser a series of celluloid sieves with perforations $\frac{1}{40}$th of an inch diameter are fixed so that the water passing through the cylinder is split up into a number of fine jets. The ozone is added with the water at the foot of the tower, and passes upwards to the draw-off pipe, which is placed at the top end of the cylinder. The energy absorbed per 1,000,000 gallons in the ozoniser averages about 60 kw.-hours, and a further 75 kw.-hours are required by the auxiliary machinery.

It has been installed in about thirty French towns, in Roumania, at Petrograd, in Holland, Belgium, Germany, Italy, Spain, Brazil, Egypt, and experiments have been undertaken at Darjeeling, in India, while an installation is in course of construction at the Knutsford waterworks, Cheshire.

The largest plant is that at Petrograd for dealing with 11,000,000 gallons per day. Here the water is first treated with sulphate of alumina, whence it passes on to thirty-eight sand filters at a rate of 1,000 gallons per square metre of filtering surface per hour, and finally enters the five sterilising towers along with ozonised air. There are 128 Siemens-Halske water-cooled ozonisers. The air is deprived of its moisture by refrigeration, and is ozonised to the degree of 2·5 grains per cubic metre.

In July, 1910, the Paris Municipality decided that the part of the city drinking supply derived from the Marne (about 20,000,000 gallons per day) should, after coarse filtration, be sterilised by ozone, half by the De Frise and half by the combined Otto process. The latter employs "emulsers," which are injectors effecting a mixture of ozonised air with the water, the action being completed in "columns of self-contact."

As to the cost of purification by ozone at Petrograd, in 1911 it was recorded as 0·86d. to 0·97d. per 1,000 gallons.

At St. Maur, Paris, Monsieur Colmet Daage estimated that the cost under most favourable conditions was 0·31d. per 1,000 gallons, excluding interest, amortisation and repairs. At Nice, where cheap water power is available, the average in 1911 was given as 0·164d. per 1,000 gallons; and at Rimiez, where there is besides no pumping, it was only 0·125d. At Ginnekin, Holland, the cost was 0·45d. per 1,000 gallons. Costly as this process of purification may be, it is probably one which is well worth the sacrifice of a little money, when it furnishes unexceptional drinking water from a source like the river Mark, whose waters have been justly described as execrable from a hygienic point of view. The capital cost for purifying 1,000,000 gallons per day would be about £3,000.

Different waters, of course, make different demands on the purifying agent, and it is recommended by the leading authorities that tests be made to determine the minimum quantity of ozone that can be with safety applied.

Chlorine Sterilisation is effected in practice by means of hypochlorites, prepared either chemically or electrolytically.

Chemical chlorine, a gas evolved from chloride of lime (the weight available in the latter being about 28 to 33 per cent), is largely used in America and at some places in Europe and India. It was employed to stop the typhoid epidemics at Lincoln, Maidstone and Cambridge. At Johannesburg, the Witwatersrand supply is sterilised by the addition of chloride of lime equivalent to 0·25 to 0·5 per 1,000,000 of available chlorine. The cost of treatment is approximately 2s. per 1,000,000 gallons of water sterilised.

The electrolytic (sodium hypochlorite) formed by the electrolysis of common salt overcomes some of the objections to the lime compound. It leaves behind only an unimportant residue of common salt, and has a slightly greater bactericidal effect.

Liquid chlorine is of quite recent date, and has not yet reached this country; it is used in the States, and has met with considerable success there, though not quite so easy to apply. Several plants have been designed which allow the chlorine to gasify into the water under proper control, and the bacterial results obtained are very good. It has the advantage over hypochlorites in not adding any salts to the water.

Ultra-Violet Rays.—The application of artificial light to the purification of water is an enterprise of recent growth and considerable scientific interest. These rays correspond to the X-rays, and have, in common with all light, their origin from the sun. Mixed with suitable elements they may be produced artificially, and our allies, the French, who have persevered largely in this direction, have invented an apparatus consisting of a mercury vapour-lamp and transparent quartz, in which electrical energy is transformed into ultra-violet rays.

The lamp is placed inside a closed cylinder, to which water is admitted and circulated under pressure from the mains, and subjected to the action of the rays produced under an electric current of 220 volts, and 120 watts are required for the purification of 1,000 gallons. The actual effect is really a question of penetration, for it has been found that colloidal matters practically nullify the action of the rays so that prefiltration is desirable.

A Westinghouse-Cooper-Hewitt apparatus at Marseilles deals with 158,000 gallons per day. There is no appreciable alteration in appearance, odour, or taste in the treated water. The capital cost of a suitable plant would be about £2,900 per million gallons per day, while the working costs would be 0·48d. per 1,000 gallons exclusive of interest and sinking fund.

WATER SOFTENING.

The ordinary methods by which water has hitherto been softened and purified are now well known and understood, and have been described and discussed in detail in many excellent publications dealing with existing systems. Although these older methods, the Clarke, Atkins, Haines, Harris-Anderson, Lassen and Hjort, and many others exhibit wide differences of efficiency as regards the actual mechanism by which the water-softening operation is carried out, they all achieve their effect by identical means—viz., the precipitation by the addition of lime and soda, in proper proportions of the hardening salts in the water, and the subsequent removal by sedimentation or filtration of the resultant sludge so formed.

The precipitation process, properly carried out, undoubtedly achieves exceedingly efficient results, and a large number of such plants are working in the United Kingdom and abroad with marked success, and for many years the process was the only known and tried method by which the softening of water could be effected.

There is now in general use another process which renders possible the achievement of results never previously attained in water softening. This is the

* From a paper read at a meeting of the Institution of Civil Engineers of Ireland on the 5th inst. at Dublin.

"Permutit" regenerative process which operates on a principle quite different from that of all existing systems.

The Permutit Process.—This process is probably the most advanced step in water softening of recent years. Permutit is a term given to the flaky metallo-aluminate-like artificial zeolitic minerals manufactured under the Gans patent, and employed in Permutit filters for softening waters to distinguish them from the natural zeolites or silicates containing water.

By the power of "base exchange," which Permutit possesses, both the calcium and magnesium carbonates are abstracted from the water directly it comes into contact with Permutit, thus leaving in the softened water equivalent sodium salts. This softening exchange action continues until each grain of the Permutit has parted with all its sodium, when it may be said to have become exhausted, and regeneration is required. This to-and-fro process of softening and regeneration is regular and automatic without wastage. Common salt is employed for regenerating the sodium Permutit, the quantity depending upon the hardness of the water plant operating for softening during the day and regenerating at night. A modern plant thus works without interruption day and night. (See Fig. 5.)

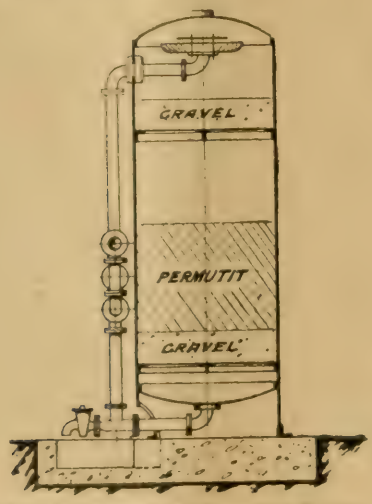


Fig. 5.—Section of Permutit Filter.

The simple method of mixing water softened to zero with untreated water in order to produce a [illegible] of a specified hardness has been adopted for some years past with unqualified success in the case of the Permutit installation laid down by the West Cheshire Water Company, who supply [illegible] water to eight townships.

The present cost is 1·90d. per 1,000 gallons, to which there is to be added from about 18 deg. Prior to the year [illegible] 729 tons salt, [illegible] interest on capital outlay.

In waters which have been drawn in shallow wells or springs from marshy districts more frequently contaminated with organic substances, is present in such conditions as to render its separation by the hitherto accepted means of aeration extremely difficult. By means however of the Permutit system that difficulty has been overcome, since by a process of exchange analogous to that previously described, the iron can be eliminated by simple filtration through Permutit, which has been treated with a manganese salt and thus converted into manganese Permutit. Incidentally the treatment has another valuable effect in that any organic matter or bacteria will, through contact with the manganese Permutit, be entirely destroyed. A system of sterilisation of water by [illegible] which on close investigation by leading authorities on hygiene has been entirely approved.

The cost per 1,000 gallons for this iron removing Permutit system works out at a figure below it is claimed ANYTHING which can be worked in a surface aerating plant, and in addition, affords the following advantages, viz.:—The separation of the iron is complete, all organic matter removed. Working expenses in connection with the removal of sludge and otherwise which are attendant upon surface aeration plants are entirely eliminated. Permutit removal of iron is carried out by means of a plant in which there are no movable parts, and the operation of which is of great simplicity.

Conclusions.

The slow sand filter, when judiciously managed, is a sufficient safeguard against the distribution of polluted water, and such was the view of Dr. Koch when he formulated his conclusions on the immunity of Altona from cholera in 1892.

It intercepts 98 per cent of bacteria, diminishes organic matter, and yields an effluent free from suspended matter. It is well known that at some seasons of the year only a small percentage of the colour is removed, and it fails to make innocuous waters containing peaty acids. The principal screen for arresting germs and suspended matter is the surface film, which requires three or four days to ripen by the accumulation of algæ and zoogloea.

The capital cost of installing sand filters varies from £8,000 to £10,000 per 1,000,000 gallons, according to the locality. The cost of maintenance and treatment varies from 4s. 2d. to 6s. per 1,000,000 gallons. The latter is furnished by the late W. B. Bryan, chief engineer to the Metropolitan Water Board.

Multiple Filtration.—As previously stated, except in rare instances, sand filter plants dealing with river water are supplied with decanting basins or settling tanks. In such a plant the usual practice has been to provide a filtering surface which will yield a filtrate not exceeding 4 in. vertical fall per hour. In the case of a multiple filtration plant, for an entirely new scheme, the basis could be safely taken at a speed of 6 in. per hour. Assuming that the multiple filters (pre-filters) are to be efficient, the sand filters should run for very long periods without cleaning, and with care it should be possible to arrange for cleaning at times when the demand was below the maximum.

Having fixed upon this figure, the area of the pre-filters has to be considered, and for very turbid waters, such as are met with in the Colonies, an average figure may be:—

Degrossissers	. .	12,250 sq. ft.
Pre-filters	...	33,500 ,,
Final filters	... ...	140,000 ,,

The effective agent of purification is spread through a considerable depth of the mass of the sand, instead of being limited to a thin film. The efficiency is thereby greatly increased. It is possible to start the filters immediately after scraping at the maximum speed without running the water to waste.

Pathogenic organisms which thrive upon organic matters in suspension and solution disappear because the water has been deprived of the bacteria which supports them, and the efficiency consequently reaches a higher degree of purification, an undoubted advantage, too, is the regularity and uniformity of the bacteriological results.

For air cleaning the gravel beds a Roots blower or similar apparatus driven by an oil engine is used, while a travelling scraper is employed for cleaning the pre-filters.

In this way an installation capable of dealing with several million gallons per day can be controlled by one man, except on the rare occasions when it becomes necessary to scrape the final filters.

Peaty acids are economically neutralised by using limestone in the roughers, as at Derwent Valley. Colour can be removed by filtration, unless it is the result of peat or other stain. In such cases permanganate of potash has been found to be both cheaper and more easily applied than sulphate of alumina, which is always wasteful in application. In any case, the application of a chemical in multiple filtration is a simple matter, owing to the number of basins comprising the plant and the frequent mixing of the effluent after each stage.

For the removal of sedimentary matters it is generally conceded that triple filtration gives better results and is more economical than subsidence basins and ordinary sand filters; and it is probably safe to say that, as its efficiency is realised in the treatment of waters subject to considerable variations in the number of bacteria, the silt in suspension, and the salt in solution, it will be more extensively adopted.

Its introduction into Paris when the authorities wished to supplement the water supply of the outer parts of the city with water from the Seine was the result of investigations carried out by their officials throughout Europe, America, and the Colonies, and

the conclusion arrived at was that by adopting the principle of pre-filtration a more economical plan with uniform results was assured.

In the case of Magdeburg the authorities had in the river Elbe an unlimited quantity of water, but contaminated to a considerable extent with salts, and somewhat badly with sewage and the refuse from factories. In order to avoid the alternative of the vast capital expenditure involved in the construction of reservoirs in very unsuitable country, they had adopted the system of multiple filtration.

Mechanical Filtration. The advantages of this process over slow sand filtration are—less capital cost, variously estimated at one-third to one-half that of the latter; economy of space; ease of management and cleansing. By the application of a coagulant, colouring matter in solution is removed; plumbo-solvent tendencies due to the presence of peaty acids are neutralised. Various observers give the cost per 1,000,000 gallons of water treated by mechanical filters as 9s. 8d. Mr. F. J. Dixon, M.I.C.E., engineer to the Ashton-under-Lyne, Stalybridge, and Dukinfield Waterworks, gives the following particulars for 1913 and 1914, relating to the cost of treating the water there per million gallons by mechanical filters:—

1913.—8s. 9d., including chemicals, carting, labour, and sundries.

1914.—6s. 11d., including chemicals, carting, labour, and sundries.

The quantity dealt with in 1913 was 1,666,962,000 gallons, and in 1914, 1,138,187,000. The percentage of washwater used was 0·908 and 0·907 respectively; the average rate of filtration 63·5 per sq. ft. per hour, and 57·9. At Newport, Monmouth, the cost is given as 11s. 7d., and at Harrogate 3s. 3½d.; the latter, removing peaty discolouration and iron, does not comprise the use of chemicals. One very important further advantage of mechanical filters is their adaptability. They can be employed as pre-filters with practically no attendant running expenses. They may be used for the removal of iron alone as in the case of deep well waters at a current rate not exceeding 1s. per million gallons treated, as at Tunbridge Wells, Cardiff, West Cheshire, Biggleswade, &c., against a charge of 10s. 6d. in the first case and 5s. in the second, when previously treated in open sand filters.

In conjunction with suitable reagents, that can be quite conveniently applied, mechanical filters may be equally adapted to the work of softening and sterilisation.

Sterilisation.—There is a tendency among engineers and bacteriologists toward sterilising supplies, and to the establishment of safeguards against the survival of a single pathogenic germ, but whether it is possible for this policy of protection to be carried to unnecessary extremes which might not ultimately be beneficial remains to be seen.

The advantages of this process are that it makes it possible to utilise much more freely than hitherto the supplies obtainable from rivers which adjoin a town—which are in fact at its door—thus saving an immense outlay in engineering works and landowners' profits, easements, &c.

In waters not oxidisable by the ordinary process, as, for example, the water of the Seine, the engineer is possibly justified in resorting to chemicals, and it seems incumbent on the profession to study carefully the progress which has been made abroad and in the States with the improved methods of sterilisation based upon the technical application of increased knowledge in the modern sciences of electricity and bacteriology.

Everything depends upon local circumstances; with reasonable care sand filtration is ordinarily a sufficient safeguard against the distribution of filtered water. Again, the economy of working and efficiency of slow sand filters can be greatly enhanced by preliminary treatment in mechanical roughing filters, as at Weardale, York, Reading, West Hampshire, &c., for the removal of the grosser impurities.

On the other hand, where initial expense is a consideration, where space is limited, and sand scanty, pressure filters have advantages. Triple filtration has been purposely dealt with at some length because many leading authorities (Dr. Kemna, of Antwerp, among the number) state that "It is rather by the improvement of existing methods than by the introduction of new processes that the science of water purification should be advanced, and by which a reduction of the death-rate may be secured." The most important question is, of course, that of safety. Drinking water, says Dr. Rideal, has got to be wholesome, not sterile; what we have to do is (1) To prevent the entrance of disease organisms; (2) To kill them if they do enter. In both objects the engineer and the chemist must collaborate, and the bacteriologist must keep watch.

"STUDS" FOR LOCOMOTIVES.

NEW LOCAL GOVERNMENT BOARD ORDER FOR TRAFFIC ON FROST-BOUND ROADS.

The following circular and Order, dated February 6th, has been addressed by the Local Government Board to the clerks of county councils and other local authorities:—

I am directed by the President of the Local Government Board to state that his attention has been drawn to the restrictive effect of the requirements of sub-section (4) of section 28 of the Highways and Locomotives (Amendment) Act, 1878, upon the movement of agricultural locomotives during the present severe weather, when the roads being frost-bound are slippery.

In view of the representations which have been made to him as to the importance of securing that agricultural operations should, as far as possible, be facilitated during the present national crisis, Lord Rhondda has decided, as a temporary war measure, to issue an Order varying the statutory requirements in question so as to enable the driving wheels of an agricultural locomotive, whilst it is being used on a frost-bound road, to be provided with studs. In any other condition of the road the statutory provisions will apply.

THE ORDER.

Whereas by section 28 of the Highways and Locomotives (Amendment) Act, 1878, it is enacted that it shall not be lawful to use on any highway a locomotive constructed otherwise than in accordance with the provisions therein set forth, including sub-section (4) thereof, which relates to the driving wheels of a locomotive:—

Now, therefore, in pursuance of the powers given to us by section 9 of the Locomotives on Highways Act, 1896, we do hereby order as follows:—

Article I.—In this Order the expression "agricultural locomotive" has the meaning assigned to it by section 17 of the Locomotives Act, 1898.

Article II.—Notwithstanding anything in sub-section (4) of section 28 of the Highways and Locomotives (Amendment) Act, 1878, the driving wheels of an agricultural locomotive which are shod with diagonal cross-bars may, while the locomotive is being used on a frost-bound road, be provided with studs constructed and attached as follows:—

1.—The studs shall be fixed securely in the diagonal cross-bars of the driving wheels of the locomotive at regular intervals and not more than 9 in. apart.

2.—The studs shall be not less than 1 in. nor more than 2 in. in diameter, and shall have a well-rounded and approximately semi-circular head.

3.—The studs shall not project more than 1½ in. from the diagonal cross-bars of the wheels.

Article III.—This Order may be cited as "The Locomotives on Highways (Agricultural Locomotives) Regulations, 1917," and shall have effect during the continuance of the present war.

L.C.C. Tramcars for Sheffield.—The London County Council are selling ten tramway cars to the Sheffield Corporation, who have been unable to get from the Ministry of Munitions a permit to purchase twenty-five new cars.

Rosyth Housing Contract.—The contract for the housing of the workers at Rosyth has been entrusted to Messrs. Holloway Brothers, London. It is understood that from 700 to 1,000 houses are to be erected during the present year.

Institution of Civil Engineers.—At a meeting of the Institution to be held on Tuesday next further discussion will take place on the paper on the main drainage system of London, which Mr. G. W. Humphreys, the chief engineer to the London County Council, read on Tuesday of last week. An abstract of the paper will be found in our issue of the 9th inst.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Did not Mr. Humphreys' paper on the main drainage system of London show us what gigantic works of sewerage were necessary and have been carried out by the Metropolitan Board of Works and their successors the London County Council? Do not these works, so skilfully designed and so well executed, redound to the credit of the engineering staffs of these bodies, and does it not show how man's ingenuity and labour can counteract the dangers inherent upon the crowding together of large populations upon small areas, a tendency which is one of comparatively modern growth? When we reflect on the sanitary condition of London only seventy years ago and what it is now, are we not afforded an idea of the vast amount of sanitary works which has been carried out in this comparatively short period?

* * * *

Do not the "Notes from Ireland" in last week's issue of THE SURVEYOR show a very lamentable want of sanitation in some of the rural districts of that country? Does it not point to the need of appointing medical officers of health for each county in order to grapple with a condition of things which ought no longer to exist in this the twentieth century? What will be the result some day if an epidemic "happens" to break out?

* * * *

Is it not rather an indication that pedestrians are becoming more careful in the darkened streets when we read in a report by the Commissioner of the City of London Police that, whereas in the last quarter of 1916 there were 258 street accidents arising from vehicular traffic, of which five were fatal, in the corresponding quarter of 1915 there were 350, of which seven were fatal?

* * * *

When we see in a recent advertisement for an important municipal appointment that the officer must not give professional evidence in any legal proceedings, or before a Parliamentary Committee, without first obtaining the consent of the Health Committee, and that all fees received by him, for any purpose whatever, must be paid into the public funds, is not one reminded of ancient Rome, where the nobles compelled their slaves to write poetry, the proceeds of the sale thereof being pouched by the owner of the slave?

* * * *

Is the addition of salt for the purpose of melting snow the right principle to adopt? Does it not cause great trouble with the electric current on conduit tramway systems? Does it not seriously affect horses' hoofs and fetlocks, and does it not form a freezing mixture which affects poorly shod pedestrians?

* * * *

Is it not a great compliment to Mr. Brodie, the eminent city engineer of Liverpool, and to English road engineers generally, that the *Canadian Engineer*, in its issue of January 4th last, made the suggestion "that it would be of distinct interest to highway engineers and road contractors in Canada if the Canadian and Industrial Good Roads Congress, which is to meet this year at Winnipeg, could induce Mr. Brodie to attend the convention and deliver an address on the subject of his bituminous sand-grout pavements laid in Liverpool"?

* * * *

What is meant by "best hand-picked and broken granite and grouce"? which appears in an advertisement issued on behalf of the town council of Banbury asking for tenders for the supply of the above materials. What is "grouce"? And does this term appear in Mr. Brodie's "Glossary of Road Terms"? Also, for the matter of that, what is meant by "hand-picked and broken granite"?

* * * *

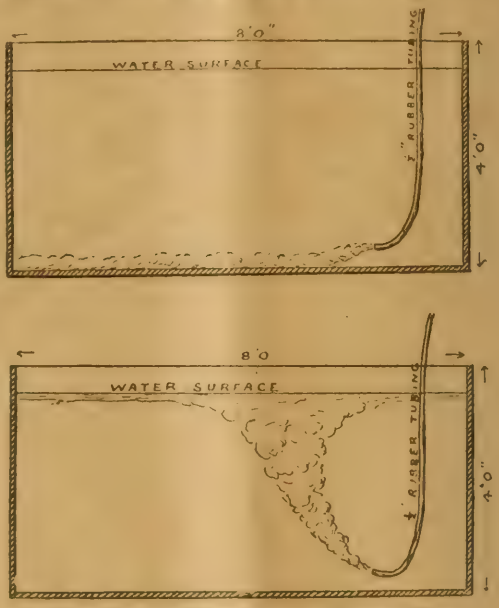
Would it not rather a novel suggestion, recently made in America, in order to prevent excessive speeds of motor cars, that each car should be fitted with a Government seal or receptacle in which should be placed cards bearing the name of the owner of the car and his photograph and address, and that by an ingenious mechanical arrangement one of these cards should be liberated and fall on the road if a certain speed were exceeded, and thus lead to the prosecution of the owner? What next?

DIFFUSION OF SEWAGE IN WATER.

[In a paper before the Connecticut Society of Civil Engineers, in which he discussed the pollution of New York Harbour and the remedies proposed, Mr. Kenneth Allen, engineer of sewage disposal of the Board of Estimate and Apportionment, described some interesting and instructive experiments dealing with the diffusion of sewage in water. We reproduce this part of his paper from the "Municipal Journal" of New York.]

Experiments were made to observe the diffusion of sewage in harbour water, first with thirty-one experiments on a small scale in the laboratory, then with twelve in a tank about 8 ft. long and 4 ft. deep in the New York Aquarium, and finally with thirty in the harbour itself.

Either tap water or sewage coloured with uranine or some other dye was injected at different depths and in different volumes into water of different degrees of salinity. As observed in the laboratory by dropping from a pipette or a fine drawn glass nozzle, some of the forms assumed were very beautiful. The form was usually an inverted cone, but circles resembling smoke rings, vertical columns of cumulus appearance, similar to the dense smoke rising from



JET OF SEWAGE ISSUING IN FRESH WATER (UPPER SKETCH) AND IN BRACKISH WATER (LOWER SKETCH).

a burning oil tank on a still day, were noted. The form depended, of course, on the velocity of the jet and the relative density of the two liquids.

To show the relative rapidity of diffusion in waters of different degrees of salinity 30 c.c. of sewage coloured with 1/10000 part of uranine was discharged gently from a pipette on the surface of 3,000 c.c. of the water in a Mason jar. When the jar held tap water only, diffusion began in a few minutes and was complete in an hour; when it contained 25 per cent of sea water diffusion was not complete until forty-eight hours, with 50 per cent sea water not until fifty-six hours, and with 75 per cent sea water and 25 per cent tap water diffusion remained incomplete at the end of a week. The experiment brought out the great advantage, so far as diffusion is concerned, in a discharge of sewage into fresh water.

One of the most interesting of the aquarium experiments consisted in the discharge of coloured sewage into tap water from a ¼-in. jet under a head of 0·15 ft. in a horizontal direction at a depth of 3·4 ft.—that is, at the bottom of the tank. The sewage first spread out in the form of a blanket about 2 in. thick over the bottom of the tank and then, after about three minutes, began gradually to diffuse. Within about a half-hour, diffusion was complete throughout the tank. When, however, the discharge was into salt or brackish water, the sewage rose in a cone to the surface, where it spread out in a thin

The Surveyor
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layer and then diffused. This illustrated clearly the tendency of sewage to remain near the bottom if discharged horizontally into fresh water until diffusion takes place.

OUTDOOR EXPERIMENTS.

In the thirty outdoor experiments the coloured liquid was pumped to different depths at different points in the harbour and the appearance of the dye on the surface noted. When three and one-third pounds of uranine was dissolved and dumped in the harbour water it could usually be readily detected after flowing one and one-quarter miles in a current of two and one-half miles per hour. Two and one-half pounds could likewise be detected at this distance if the current were 1·6 miles per hour. If conditions of light were good, and unless greatly diffused, the field of colour was readily visible from the deck of a launch at a distance of 2,000 ft.

Most of these experiments were made by pumping a dilution of one-part uranine in about 2,000 of tap water or sewage from large casks, holding in all about 1,000 gallons, through a 1¼ in. hose to different depths with a velocity of 6½ ft. per second and noting the result at the surface.

At the proposed location of the Passaic Valley sewer outlet near Robbins Reef when the specific gravity of the harbour water was 1·020, a 1:500 solution of uranine pumped to a depth of 40 ft. was discovered at the surface.

On another occasion 16,500 gallons, having a dilution of 1:2750, was pumped through a 2½ in. hose to a depth of 40 ft. with a velocity of 14 ft. per second. The specific gravity of the harbour water at this time was 1·0125. No sign of the dye was, however, noted at the surface.

In a yet larger test 56,000 gallons of tap water, containing 290 lb. of uranine were pumped from a pontoon through an 8-inch pipe to a depth of 40 ft. at a rate of 2,320 gallons per minute. The velocity of the current at a depth of 3 ft. was 0·45 ft. per second; at a depth of 20 ft., 1·03 ft. per second, and at a depth of 50 ft., 2·85 ft. per second. At the point of discharge, 40 ft. below the surface, it was estimated at 2·2 ft. per second. The specific gravity of the harbour water ranged from 1·015 at the surface to 1·018 at a depth of 50 ft., and the temperature was 72 deg. F. In spite of the large volume discharged this was not detected on the surface.

CONCLUSIONS.

Several important conclusions are drawn from these seventy-nine experiments relative to the discharge of sewage into bodies of water.

In the first place, the effluent will rise in still water towards the surface or fall, depending solely on the relative specific gravity of the two liquids. In sea or harbour water it will rise, while in upland water of considerable purity it will remain at the level of discharge or fall toward the bottom.

Immediately after its discharge sewage begins to diffuse and commingle with the surrounding water. This diffusion will take place more rapidly the less the salinity, and probably bears some relation to the volume, or exposed surface, of the effluent; but at this stage diffusion is of less importance than the mixing action or dispersion. The latter depends largely on the relative velocity of the sewage effluent and the stream into which it is discharged. If the current is rapid or with turbulent eddies the mixing will be rapid and may obliterate any buoyant effect due to the original specific gravity of the sewage. In equal mixtures of sea and upland water, however, sewage will rise, and may be expected to reach the surface so as to be detected from depths up to 30 ft. From depths of from 30 ft. to 40 ft. it is uncertain whether it will make its appearance. Much depends upon sub-surface currents. But at depths greater than 40 ft. it is not likely to be seen at the surface unless discharged in very large volumes.

In still water of from ·004 to ·016 greater specific gravity, sewage will rise at the rate of from 0·10 to 0·17 ft. per second.

THE PURIFICATION OF WATER IN WAR TIME.

The wisdom of all the ages, concentrated in this question of purifying water for use in a military campaign, has now (says Captain J. C. McWalter, M.D., LL.D., D.P.H., R.A.M.C., Mediterranean Expeditionary Force, writing in the *Journal of State Medicine* for February) reduced itself to adding a few grains of common chloride of lime to each 100 gallons—to be meticulously exact, 30 grains to 100 gallons of water. This minute proportion effectively kills off organisms of the coli group and renders the water perfectly potable—that is, if it were a fairly sound water before the chlorinating process.

It must be admitted that the chlorination process is distinctly satisfactory. It is simple, it is cheap, it is safe and effectual. Like all earthly things, it has its drawbacks, but many of these are imaginary. The crude honesty which prevails of calling this purified water (wherein there is scarcely one part of chlorine in 1,000,000) "chlorinated water" has rather played on the nerves of the sensitive Tommy and still more of the susceptible officer. If an Army order went forth deciding that it should be called "purified" rather than "chlorinated," very much of the prejudice against it would vanish. If just a little care were taken that neither too much nor too little of the chloride of lime were added, then another source of complaint would disappear.

The chloride of lime is a constant source of trouble. It is supposed to contain about 33 per cent of available chlorine when fresh, and most calculations are made on the basis that it contains 30 per cent, but in tropical countries, far away from home, where the supply is probably from six to nine months old, it was found that the proportion varied from 8 to 24 per cent. It is now usually sent out in well-corked glass bottles, but when a bottle has been opened several times its strength rapidly diminishes, and even with an absolutely new bottle it will be found that the top is far weaker than the centre portion.

When chlorinated water lies in a tank for a few days, I have found the percentage of free chlorine diminish by about 25 per cent, and the bacteriological test shows a more unfavourable result. This is apparently due to the formation of hydrochloric acid in minute amounts, as well as to the natural evaporation of the chlorine. If therefore a tank has to lie for many days before being consumed, it may be necessary to test its strength again and to rechlorinate it.

When used for cooking purposes it is well to boil the chlorinated water for a couple of minutes, so as to drive off as much as possible of the chlorine.

Urban Authorities and Pig-keeping.—Halifax Corporation have announced that they are willing to waive the local by-laws, so far as they prohibit the keeping of pigs within 100 ft. from any dwelling, in cases where it is not likely to be detrimental to public health or cause a nuisance. Ossett Town Council have decided on similar steps.

Law Notes.

Edited by J. B. REIGNIER CONDER, Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the Office of The Surveyor, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. **All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction** i.e., **without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

Highway Fallen Tree—Damage to Passenger Locomotive.—In *Hudson and Another* v. *Berry* (King's Bench Division, December 12th), the defendant appealed from the decision of the judge of the Bishop's Stortford County Court. The facts were as follows. On the night of December 27th a tree growing on the defendant's land was blown down, and fell across the highway, at a point where the road passed through a cutting, with its top resting on the opposite bank, some 5ft. high, and its roots on the bank on the side on which it grew, some 3 or 4 feet. At the time they viewed the road foreman of the Herts County Council and two of the defendant's men were engaged in trying to remove it, but without success. They ceased work when it became dark, and went off to fetch a light, and about a quarter of an hour later the plaintiffs drove along the road in a motor-car, and ran into the tree, damaging the car and receiving personal injuries. The county-court judge held that the defendant had been guilty of negligence in failing to light or guard the tree and gave judgment for the plaintiffs. The appeal was allowed on the ground that there was no evidence of negligence. In the course of his judgment Mr. Justice Bailhache said that in *Gadsby* v. *Smith* (12 Q.B.D. 121) it was held that an omission to remove an obstruction may be wilful obstruction of a highway under the Highway Act, 1835. The present action, however, was not for failing to remove the tree, but for failing to light and guard it. He thought there was no duty on the defendant to set a person to watch it to light the tree, and, at any rate, the accident happened while a light was being fetched. Mr. Justice Avory said that there was no culpability under the Highway Act, 1835 (either under section 65 or section 72), to light or guard the tree, although the defendant might have been guilty of wilful obstruction if he had failed to remove it after notice from the highway surveyor.

QUERIES AND REPLIES.

In order to avoid confusion queriists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

Subscribing Banks and Trees Across Highways in Rural Districts.—"S. Y." writes: I shall be glad if you will give me your opinion on the following:—(1) Who is liable to keep away the earth of fields adjoining the highway which subsides into narrow lanes? I may say the roads are in like cuttings, with banks 9 ft. to 10 ft. high on each side, and there are signs of large quantities of earth subsiding into and blocking up the road. (2) When trees fall down across the highway, whose duty is it to remove them? Are the council liable should an accident occur, and must they protect the obstruction by lighting and watching? What precautions should be adopted in both cases?

(1) In my opinion it is the duty of the owners of the fields to keep back the earth, and if they fail to do so after notice from the council they can be summoned for contempt under sec. 72 of the Highway Act, 1835. See *Coleman* v. *Harvey* (12 J.P. 39). But if notice of the obstruction was given to the council by a justice of the peace for the county it would be the duty of the council to cause it to be removed within twenty-four hours, under sec. 65 of that Act. This is rather more doubtful, but I think that if the owners of the trees failed to remove them after notice from the council, they would probably be liable to penalties of obstruction under sec. 72 of the Act, and the council could recover from them the expenses they were put to in the case of subsiding banks. In the event of such owners being a justice of the peace for the county, under that section the council would, in my opinion, of course have to provide for the lighting and watching of the obstructions pending their removal. Otherwise they might be held liable should an accident occur. As to the procedure in both cases, notice should be given by the surveyor to the owners requiring them to remove the obstructions, and if the notices are not complied with proceedings can be taken under sec. 72.

Highway Duties to Ordinary Use of Motor Car.—"L. C." writes: A gentleman driving his motor-car over a few months ago (at not excessive speed, I am assured) carelessly knocked a lamp, though not absolutely knocking it over. I immediately had it fastened up so as not to fall on pedestrians. I then wrote to the gentleman claiming damages, and he replied saying he was not liable, as the damage was caused through the car skidding, but without prejudice he did not mind undertaking to pay 25 per cent. of the cost. I was instructed by my council to write and decline his offer, and he has now replied that if I will get the work done he will be prepared to discuss the matter afterwards, but, of course, still without prejudice. My council have instructed me, in the absence of our clerk, to take legal proceedings. I shall be glad of your opinion. Can I issue the county-court summons for the recovery of the estimated damage, or is it necessary that the work should be done first, so as to ascertain the actual cost, and then issue the summons for that amount?

A summons can be issued at once, claiming as damages a sum sufficient to cover the estimated cost of repairing the lamp.

Building By-laws: Air-space.—"B. L. A." writes: A builder has submitted a plan of a new building on a plot of land situated between two public streets. Our by-laws are similar to the Model By-laws, and the air-space provided in front of the building is in conformity therewith. The height of the building is 25 ft. The extent of the air-space at the rear of the building is 150 sq. ft., but the distance across the space to the street boundary is only 10 ft. The street is 15 ft. wide. I shall be obliged if you will let me have your opinion as to whether the rear air-space is in order.

In my opinion the rear air-space is not in conformity with No. 54 of the Model By-laws. That by-law provides that, if the height of the building is 25 ft., the distance across the open space "to the boundary of any lands or premises immediately opposite or adjoining the site of such building" shall be 20 ft. at the least. In the present case, I am of opinion that the street is "land adjoining the site of the building" within the meaning of the by-law, and that, therefore, the distance across the air-space, measured to the street boundary, should be not less than 20 ft. See *Jones* v. *Parry* (57 L.T., 192). The width of the street is not material.

Rural District Councillor: Appointment as Surveyor.—"H. H." writes: Can a member of a rural district council, on the death of the surveyor, be appointed in his place as a paid servant? I believe in the Poor Law a member of the board must resign at least two years before being appointed.

Under sec. 46 of the Local Government Act, 1894, the appointment of a rural district councillor as a paid servant of the council would disqualify him from continuing to act as a member of the council, and it would be the duty of the council to declare his seat vacant and proceed to another election. See *R.* v. *Rickards* (70 J.P., 163).

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

APPLICATIONS FOR LOANS.

Barrow T.C. £11,255 for electricity purposes.

Derby T.C.—£29,500 for the extension of the electric power station.

Merthyr T.C. £2,000 for the construction of a drain at Troedyrhiw.

St. Helens T.C.—£12,000 for electricity extensions.

LOAN REFUSED.

Bournemouth T.C. £1,200 for a motor fire engine and motor chassis.

FORTHCOMING INQUIRIES.

FEBRUARY.	£
20. **Eston.** For the purchase of property for a new street (Mr. E. Leonard)	—
27. **Hoylake.** For the purchase of a motor fire engine (Mr. A. G. Drury)	1,100

Freezing of Water Mains and Services.*

By WILLIAM WHITLOCK BRUSH.

The transformation of water from the liquid to the solid state known as ice, as a result of the abstraction of heat from the water, is a process familiar to all, but the exact conditions under which such transformation takes place are not so generally known. This withdrawal of heat may be by means of radiation, conduction or convection, the transfer of heat being accomplished by any one of these agencies operating singly or in combination.

Fresh water increases in density as the temperature is lowered, until a maximum is reached at 39 deg. Fahr. There is then a gradual reduction in density to the temperature of 32 deg., when the liquid changes to the solid form known as ice, with a specific gravity of 0·89. It is this transformation that is particularly interesting to waterworks men, and some of the more important features of such transformation will be briefly discussed. The temperature of water is remarkably constant while ice is forming or melting. The temperature of the air may be many degrees below zero, but the temperature of fresh water, even though it be in a rapid running stream, will not be more than 0·01 below 32 deg. Fahr. Again, as long as there is ice in the water the temperature will only be a similarly small fraction of a degree above 32 deg. Fahr., even though the temperature of the air be many degrees above the freezing point. A mixture of ice and water forms the most constant temperature known to physicists.

It is popularly believed that running water may be lowered to a temperature of several degrees Fahr. below the freezing point before ice will be formed. This is an error. Absolutely still water may be cooled to approximately 10 deg. Fahr. below the freezing point without ice forming, but as soon as there is the slightest agitation of the water an immediate formation of ice takes place and continues until the heat released by the change from water to ice warms the remaining portion of the water to the freezing point. The latent heat of the water at the freezing point is large, amounting to 80 calories per gramme, or sufficient to raise 143 pounds of water 1 deg. Fahr. for every pound of water changed to ice.

FORMS OF ICE.

Ice is divided into three kinds, based upon the manner in which it forms *i.e.*, surface ice, frazil ice, and anchor ice.

Surface ice is the common form which appears on the surface of the water when the temperature of the water is cooled to the freezing point. It appears first near the shore and gradually extends out as the deeper water is cooled, the entire surface being eventually covered after the temperature of air remains below the freezing point for a sufficient period to cool the entire surface water to just below 32 deg. Fahr. After the ice is formed, the thickness increases, mainly through the conduction of heat from the water through the ice, it being necessary to conduct not alone the heat in the water, but also the latent heat previously in the water, which is released as the water changes to ice. As the conductivity of ice is low, being only one thirty-second of that of iron, this process is relatively slow, and the thicker the ice sheet the slower the increase in depth of ice.

Frazil ice is the form which appears in running water when the temperature of the water falls below 32 deg. Fahr., and where an ice sheet cannot form due to the agitation of the water. It forms at the surface, and may be made up of flat plates, if the surface is not greatly agitated, but more frequently is in the form of minute needle crystals which join together and form a bulky mass floating lower in the water than the ordinary surface ice.

Anchor ice is ice which is found attached or anchored to the bottom of a river or a stream, and results from the cooling of the material at the bottom of the river by radiation, and the resultant freezing of the water which comes in contact with the surfaces, which have been cooled below the freezing point. It will only occur under a clear sky and where there is nothing to interfere with the process of radiation. As dark objects radiate heat more rapidly than light-coloured ones, anchor ice will form more rapidly on a dark stone than on a light one. It will not be formed under a bridge where radiation is interfered with, nor under ice, which also prevents radiation. When the sun's rays strike the masses of ice, earth and stone, they are absorbed, and frequently the whole mass will become loosened and float to the surface. Large rocks are thus raised and carried down stream with the ice.

These three forms of ice are all of interest to the waterworks engineer, not alone as affecting the problems to be met at the source of supply, when such source may be a reservoir or stream, but also in the distribution of water, as will be shown later.

It is generally considered that ice is a poorer conductor than water. This belief is probably founded upon the very material protection which ice or snow gives against frost penetration. Such protection is mainly due to the resistance of ice and snow to the transmission of the heat waves of radiation. Clear water offers little resistance to the radiation of heat, but is a very poor conductor of heat. Due to the difference in density of water at different temperatures, water will transmit heat through convection, or the movement of the molecules, much more rapidly than will ice, by conduction. The molecules of ice are unable to move freely, and transmission of heat through ice, by convection, is therefore negligible.

Pressure lowers the temperature at which water changes to ice, but its effect is very slight; thus, a pressure of 1 lb. per sq. inch will lower the freezing point 0·009 deg. Fahr. Assuming the normal pressure in a water main to be 40 lb. per sq. inch, the lowering of the freezing point by such pressure would amount to less than 0·01 deg. Fahr.

The introduction of certain chemicals into the water lowers the freezing point. The most common chemical found is salt, and all are familiar with the lowering of the freezing point caused by the presence of salt. The volume of salt determines the temperature at which the ice forms, the salt being thrown out by the crystallisation of the water, so that ice formed in salt water is fresh. The ordinary sea water will freeze at about 27 deg. Fahr., and the temperature of the water is therefore well below the freezing point of fresh water. As the percentage of salt in the water decreases, the freezing point rises, but this freezing point is probably below 30 deg. Fahr. in the tidal waters surrounding our sea-bound cities.

FORMATION OF ICE IN WATER MAINS.

The formation of ice in water mains is dependent upon the temperature of the water in the main and the velocity of current, the pressure being of negligible effect, as has previously been shown.

It is probable that the water as drawn from a reservoir or stream is seldom below 33 deg. Fahr., as the formation of ice and the density of the water generally prevent the cooling of the water below this temperature. If the water in passing through the main is not reduced in temperature to below 32 deg. Fahr. there will be no danger of freezing. If it is reduced below 32 deg. Fahr. ice will begin to form, the ice forming a coating on the inside of the pipe, due to the high conductivity of the iron. As the ice film thickens, the transmission of the heat of the water to the surrounding earth and thence to the air is greatly retarded, the conductivity of ice being such a small fraction of the conductivity of the iron. If the velocity in the main is reduced through a lowering of the rate of draft, the water in the main is more readily cooled, and the rate of ice formation correspondingly increases.

This ice formation may be properly classified as surface ice. It is probable that in a main where the velocity is high the water is cooled slightly below the freezing point and a form of frazil ice created. Such ice might eventually clog the main, stopping the flow and the whole mass of water in the main quickly change to solid ice. A stoppage of flow may also occur after a thaw due to the loosening of the film of ice which has formed during the cold spell, and which may break up and float through

*From a paper read before the American Waterworks Association.

the water until it reaches a point in the main where the ice may not have broken loose and where the flow may be wholly packed in such a manner as to completely stop the flow.

While this might account for the stoppage of flow in mains, especially in house services, after a thaw, which is at times not uncommon to waterworks superintendents, there is a record of an actual reduction in temperature of soil below 32 deg. Fahr. following a thaw, and such reduction would be ample reason for the freezing up of water mains coincident with a thaw.

PREVENTION OF FORMATION OF ICE IN SUBAQUEOUS MAINS.

Where a main is laid in salt water it is common practice to lay the main without any earth cover. The iron is therefore exposed directly to the salt water, which is usually in motion, and heat may be rapidly abstracted from the water in the main through the three agencies of transmission—*i.e.*, radiation, conduction and convection. Radiation is active in clear water, and especially so from the black pipe. The iron is also an excellent medium for conduction, with the heat being absorbed from the surface of the iron by the water flowing over the pipe. Convection will readily do its part within the pipe. The temperature of the salt water during a period of severe cold may be lowered several degrees below the freezing point, and under such conditions ice will form in the water main, and the main will be completely clogged, unless the rate of flow is sufficient to maintain the temperature at the discharge end of the main at or above 32 deg. Fahr.

If a main is laid in a body of fresh water, there is little danger of freezing except at the point where the main enters the water, as the temperature of the water will be above 32 deg. Fahr., and a covering of surface ice will prevent excessive radiation. If the main is laid in the bottom of a rapidly-flowing fresh-water stream, it is possible that, through radiation and the cooling of the water in the stream, ice might form in the main, but it is improbable that such ice would be of sufficient thickness to interfere with the delivery of water through such main.

FROST PENETRATION ON LAND.

The committee of the New England Waterworks Association, which reported in 1909 on freezing of water mains, stated in their report that they had received ninety replies from 320 circulars sent out to waterworks engineers and superintendents, fifty-three communities had had trouble with freezing of mains, 50 per cent of the freezing had occurred at dead ends, and in all cases there had been little or no velocity.

In all but three cases the mains were smaller than 10 in. in diameter, and only seven as large as 8 in. in diameter. In every case the ground was frozen below the axis of the pipe; 40 per cent of pipe was laid in clay, 48·6 per cent in gravel, 5·7 per cent in sand, and 5·7 per cent in rock. The depth of penetration of frost was found to be 1 ft. greater in the streets than in the fields, and 1 ft. 5 in. deeper in gravel than in clay, the depth in sand being about midway between the depth in clay and in gravel. The ice was found at times in concentric rings in pipe as large as 24 in. in diameter, and no stoppage of the pipe had occurred. The ice formation was not always solid, but sometimes in the form of slush. The depth of frost penetration varied materially.

The committee called attention to a belief or tradition that existed in the minds of many plumbers and waterworks superintendents, that most stoppages occurred during a thaw, following a period of severe cold weather, it being suggested that this might be caused by evaporation from the surface during the early stages of the thaw, producing additional evaporation at reduction of temperature at the point of a water main sufficient to cause freezing. The committee suggested that the reports received did not support the theory.

PREVENTION OF FORMATION OF ICE IN MAINS AND SERVICES.

Where frost penetration has extended to and possibly beyond, the level at which a water main or service has been installed, the water in the main or service will freeze unless the temperature of the water in such mains is kept at or above 32 deg. Fahr. This can only be accomplished by having such quantity of water pass through the main that the rate of abstraction of heat will not be sufficiently rapid to cause the temperature of the water to fall below 32 deg.

By testing the temperature of the water as it is drawn from a hydrant, it can be determined whether there is or is not likelihood of the main freezing. No rule can be formulated which would answer the question as to whether a main will freeze under given conditions. A protecting covering is certainly a great aid in reducing the danger of freezing, and snow on the ground is an almost sure preventive.

THAWING ICE IN MAINS AND SERVICES.

The problem of thawing out frozen mains and services has been greatly simplified through the utilisation of the electric current at low tension. While it was found that this method was not of much value when applied to a main laid in water, where the heat generated through the passage of the electric current would be rapidly dissipated by the flowing current of water, the condition where the pipe is covered with soil is entirely different and much more favourable to the thawing of the main. As the electric current passes through the metal, the heat generated will thaw both the ice which is formed within the main and the ice which is formed in the soil outside of the main. The transmission of this heat to the surrounding earth and thence to the surface is very slow, and a comparatively small amount of current is required to make the necessary change from ice to water. It is not necessary to describe the actual application of electricity to the mains, as this has been set forth in detail many times.

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ

(One man does not see everything.)
—Euripides.

THE CIVIC SURVEY OF SOUTH-EAST LANCASHIRE.

To the Editor of The Surveyor.

Sir,—I am sorry Prof. Abercrombie feels that the town planning article in your Annual Issue does him and the architects associated with him on the Civic Survey of South-East Lancashire an injustice, for that was far from the intention of the writer of the article. From the tone of his letter he appears to be more piqued at the shortness of the notice than at any lack of accuracy in the criticism; but as your readers were referred to the very full description and discussion of this survey in your columns of October 27th last, I do not think he could reasonably expect much space to be devoted to it in your Annual Issue.

I think Prof. Abercrombie hardly does the writer justice in merely quoting the damnatory part of the sentence, and omitting the laudatory portion. Speaking of the plans, I said, "while they came in for a good deal of admiration for their novelty and artistic character, they, unfortunately, showed the lack of practical requirements which is so often associated with fine artistic qualities." I see no reason to alter this opinion, and I am somewhat surprised that Prof. Abercrombie should take exception to so mild a criticism after the admissions he made at the meeting in Manchester. He said the committee of architects responsible for this survey were practically experimenting, had made several mistakes which they hoped to avoid in the future, and invited suggestions from the municipal engineers present for the improvement of the plans.

The writer of the article was present at the Manchester meeting, and he certainly got the impression that the admiration for the industry and artistic ability shown in the production of these plans was largely discounted by the disappointment felt at the want of grip of practical requirements that they displayed. When architects undertake to do engineering work mistakes are almost bound to be made, and the Professor's letter shows how dangerous it is for municipal engineers to ally themselves with such undertakings, for he practically saddles them with the responsibility for its failure.

To deal with the principal exhibit first—the traffic plan of the roads in the Manchester district. The idea of this plan was admirable; but for it to possess any practical value it should have been complete and accurate, and, unfortunately, it could not claim to be either. A census of traffic which makes no distinction between a motor bicycle and a steam lorry is of no value, as it affords little assistance to those who have to decide on the necessary width of

the road, not to speak of a matter of equal importance to councils and their surveyors, the wear and tear of the roads. When this census is restricted to one hour in the day, and produces the astonishing results shown on this plan, one is certainly justified in saying it has little practical value.

Although the architects engaged on this work had local experience to guide them, they did not realise that a census for one hour only would probably give a very misleading idea as to the maximum traffic, if the outgoing and incoming traffic maximums were required. The plans showed that the traffic on one side of the road was twice as great as that on the other, and it remained for a local municipal engineer to point out that this lop-sided result was due to the traffic leaving the docks early in the day, and returning from other towns at a later hour than that at which the census was taken.

The Professor defends this action by saying that "if it took one year of the work of the staff to obtain the traffic counts of one hour each, it would take twelve years on the basis of twelve hours." The sensible way of looking at it appears to me to be that if they had not got the staff to do the work properly they should not have spent time and money in obtaining a census which could only be inadequate and misleading. The work which seems so stupendous to Prof. Abercrombie was being done by municipal engineers all over the country when the war broke out. Nearly every county and borough surveyor in this country was engaged in taking a census of traffic in August, 1914, and was taking it not for one hour only, but from twelve to twenty-four hours in the day, for a fortnight. Not only did they do the work for this greater length of time, but they also took much fuller and more accurate particulars; for it is evident to the merest tyro in municipal engineering that the mere number of vehicles using a road is of little value for practical purposes, and that the character and approximate weight and speed of the vehicles is also necessary.

Another matter to which reference was made in the discussion was the attempt to show on one plan, by over twenty different colours, the various classes of buildings and lands. The result was, as might easily have been anticipated, that we found a riot of colour which might find favour in futurist art circles, but to most men it simply represented confusion and chaos.

One other remarkable feature of the exhibition was the large scale hill-shaded contour plans, which had been produced to assist water engineers with their water supply schemes. Without questioning the industry and artistic qualities of the draughtsman who prepared this and the smaller scale contour plans, one may ask where a water engineer needs a 1/2500 coloured contoured plan for a preliminary watershed scheme? The scale of tone values on the large and small scale plans were dissimilar, and one could not help feeling that they had been prepared more with the view of offering scope for the colourist than of being of any great service to the engineer. Prof. Abercrombie said in his opening remarks that they had hoped at first to revise the Ordnance plans, but found that their architectural training was not of the character required for making an accurate revision of these plans. They have probably found that this is not the only direction in which their limitations have put a stop to their good intentions, and one can only wonder at the assurance they display in tackling the levelling necessary for the preparation of a contour plan to so large a scale as that exhibited at Manchester.—Yours, &c.,

THE WRITER OF YOUR TOWN PLANNING ARTICLE.

BUILDING BY-LAWS.

To the Editor of THE SURVEYOR.

SIR,—I was very glad to see your note this week about by-laws. If your practical journal continues, as it has in the past, to help these regulations to evolve into something more efficient, it will indeed be doing valuable work.

But why not be "light-hearted" about the matter in these drab days? Up to now we have treated the by-laws far too reverently, perhaps on account of their age. As they grow older they hardly—as Alice would say—become "betterer and betterer." Some of them, although over military age, certainly ought to go!

And have the existing by-laws effectively checked "the gentle art of jerry-building"? An inspection of suburban property built around London during the last fifteen years makes one wonder.

I fail to see inconsistency between my two statements that "the abolition of many of these out-of-date and inconsistent enactments is now a matter of national importance," and "to keep up a high sanitary standard, and to prevent flimsy construction, is essential." The differentiation, according to district, is, of course, most necessary, and in itself presents a first-class problem.

In many neighbourhoods the present system has absurd results. At the moment I have in front of me a pile of by-laws, all relating to districts in which the local conditions are almost alike. The varying requirements insisted on by the different authorities is extraordinary.

Lately, and since the publication of my book, "The Cheap Cottage and Small House," which contains a chapter on by-laws, I have received a good deal of correspondence from landowners, council officers, and others, confirming my assertion as to the cottage famine being partly due to the harsh building regulations in force in rural parts. Never before has this lamentable shortage in the supply of country dwellings been so serious. The old cottages, picturesque certainly, but usually in irremediable disrepair, have not been renewed; to build in accordance with urban by-laws, or those based on urban requirements, is too expensive. The detached rural dwelling, especially, has almost ceased to be. Our countryside is becoming depopulated.

Take, as an example, a tiny cottage I am now carrying out for the use of an agricultural worker. From the site—which is seven acres in extent, and "miles from nowhere"—not a house is to be seen. The by-laws allow a shed to be built in 4½ in. brickwork, but an inside wall between the cottage and this shed (over which the main roof is continued) has unnecessarily to be 9 in. thick. The drainage consists merely of a sink waste. But the local authority insists on a cesspool being built at least 60 ft. away from the building. So my client is put to the expense of excavating for and laying over 75 ft. of 4-inch glazed stoneware pipes. Each end of the system has to be ventilated, as does the cesspool, which must be built of brickwork surrounded with concrete.

And this in War-loan days, when labour and building material have never been so scarce and costly!—Yours, &c.,

GORDON ALLEN, F.R.I.B.A.

Holmdale-road, Hampstead,
Feb. 10th, 1917.

DECIMAL WEIGHTS, MEASURES, AND COINAGE.

To the Editor of THE SURVEYOR.

SIR,—I venture to point out that Mr. Barton's reply to my letter (in your issue of February 2, 1917) is really no answer at all. Will you allow me to put him the following questions:—

(*a*) Is it true, or not true, that a metre of 39·6 in. exists in British weights and measures (see "The Encyclopædia Britannica," Vol. xxiv., page 484, paragraphs 13-3?

(*b*) Is it true, or not true, that this metre is still to be found in our rod, pole, perch, chain, furlong, square rod, rood, and acre?

(*c*) Is it true, or not true, that our British ton is metric, with reference to the ancient Belgic yard, which goes back to the third century, in this island's history, and which can be traced back to ancient Egypt?

(*d*) Is it true, or not true, that this Belgic yard is within one-thousandth part of accuracy as an earth metre, while the French metre is over ¼ inch short?

(*e*) Is it true, or not true, that the adoption by us of the metric system would benefit the Central European Powers, most of all European metric countries?

(*f*) Is it true, or not true, that the re-establishment of our ancient metric system would cause us no inconvenience at all?

(*g*) Is it true, or not true, that the compulsory adoption of the metric system would cause us immense inconvenience and loss? If not, why not?

I think, Sir, that is enough to begin with. I sincerely trust I have not been called a prophet in vain, though I expect little honour in my own country and in my "father's house"! I am consoled by recollecting that metric advocates have prophesied the "coming of the metre," so may share my disgrace!—Yours, &c.,

E. A. W. PHILLIPS, M.INST.C.E

Hove, February 12, 1917.

Municipal Work in Progress and Projected.

In addition to the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Bedford T.C. The town council have adopted a recommendation of the Public Works Committee instructing the borough surveyor to intimate to owners, occupiers and agents of property that, where desired, the work of making good defective fittings could be done by corporation plumbers at the cost of the persons giving the orders.

Bournemouth T.C.—The borough engineer, Mr. F. P. Delaney, has received instructions to prepare plans and estimates for a timber groyne at Portman Ravine; the two timber groynes near the western and eastern ends of the sea wall at Fisherman's walk; for a kiosk at Fisherman's walk, and for a lavatory at Fisherman's walk.

Swansea T.C. During consideration of plans at a meeting of the Highways Committee, the borough surveyor, Mr. J. R. Heath, objected to a certain plan on the ground that the light of the back window was obstructed by the proposed new building in the back portion of the house, and the by-laws were therefore contravened. The chairman (Alderman T. Merrells): Many are doing this kind of thing in ignorance. I do not want to suggest that we should take proceedings, but they are all liable to be prosecuted. It is only by chance that we find this out. The plan was not passed and the warning was ordered to be sent out that any similar contraventions in future would result in a prosecution.

HOUSING AND TOWN PLANNING.

Chesterfield T.C. A scheme involving the erection of 200 houses is in course of preparation.

Coventry T.C. The erection of 200 houses off Park Street is being considered.

MOTOR TRANSPORT.

Birmingham T.C. The corporation have purchased from Messrs. Clayton & Shuttleworth, of Lincoln, a 5-ton steam wagon with end tipping body, for the use of the water department.

Bolton T.C. It has been decided to purchase a battery-equipped tipping wagon.

Cheltenham T.C.—An Orwell battery-equipped van has been purchased from Messrs. Ransomes, Sims & Jefferies for £721.

Cork T.C. The chairman of the Public Works Committee, Mr. D. Horgan, asked the committee to consider the question of adopting motor vehicles. He read a report of the adoption of motor vehicles for scavenging by the Brighton Corporation. One motor vehicle would do the work of six horses. Their streets were good and the channels were worse. They had been subjected to much criticism and should take steps to remedy things. The matter will probably receive attention at a conference which it is proposed to hold with the Public Health Committee with respect to street cleansing.

Hetton U.D.C.—Estimates are being obtained of motor and other lorries for scavenging work.

Leyton U.D.C. A battery-equipped van has been purchased for refuse collection for £1,075.

Manchester T.C. A 5-ton steam wagon has been purchased for use in connection with street paving work.

Morley T.C. The purchase of a motor wagon is being considered by the Sewage Purification Committee.

Rotherham T.C. It is intended to purchase a motor van for the gas and lighting and tramways department.

St. Helens T.C.—The Gas and Lighting Committee propose to purchase a steam motor wagon.

Walsall T.C.—The Public Works Committee recommend the purchase of a motor lorry at a cost not exceeding £361.

Wolverhampton T.C.—The manager of the motor omnibus department has received authority to purchase two Tilling-Stevens petrol-electric chassis, together with two bodies, at an estimated cost of £1,016 each.

REFUSE COLLECTION AND DISPOSAL.

Camberwell B.C. The borough engineer, Mr. W. Oxtoby, in his annual statement on the estimates, says he thinks that from a public health point of view it is madvisable to reduce the estimate for the removal of house refuse.

Edinburgh T.C.—The prices obtained for the waste paper after it has been sorted vary from 31s. 3d. per ton for the "mixed" to 90s. for the "white." During the six months ending December the quantity of paper sold amounted to 497 tons 4½ cwts., and the price realised was £1,188. The cost of sorting is approximately 10s. per ton.

Hove T.C. The town council have confirmed the recommendation of the Sanitary Committee with respect to the removal of house refuse for the half-year ending September next. The present contract is £5,860 per annum, and the committee recommended that the terms of the same contractor be accepted for the next half-year, his price being £3,600, with a reduction of £60 per month for any month on which it should be arranged that the collection should only be once a week and the twice-weekly collection waived.

Newport (Mon.) T.C.—The Refuse Destructor Committee are considering the question of putting down plant for the manufacture of fertilisers in order to assist in the cultivation of the land.

ROADS AND MATERIALS.

Axminster R.D.C.—The council have written to the county council stating that the council were of opinion that no tarring of roads should be done this year in any part of the county. However, if a grant was made to other councils, the council felt they should be equally treated.

Birmingham T.C.—The general manager of the tramways undertaking has been instructed to prepare a scheme of subways for the central districts.

Broadstairs U.D.C.—The council have approved the plan and estimate of the surveyor, Mr. H. Hurd, for the diversion of the promenade footpath at the Western Esplanade, opposite Leybourn-road, at an estimated cost of £125.

Cambs C.C. The council have adopted an estimate of £21,771 for road maintenance, to be apportioned as follows: Patching with granite and tarred slag, with steam rolling, £12,818; ditto, with the addition of further coating: Between Foxton and Royston (tarred slag), £1,189; between Fowlmere and Flint House, £972; between Newmarket and Fordham, £394; between Burwell and Fordham, £306; between Newmarket and Thetford, £1,154; between Horseheath and Haverhill, £199; on Huntingdon road, near New Inn, £238; between Eltisley and Whitehall, on St. Neots road, £485; at foot of Arrington Hill, on Old North Road, £212; near Arrington Bridge, on ditto, £165; between Orwell and Tadlow, on Potton road, £188. The council have also approved a provisional estimate of £6,000 for tarring. The complete provisionally estimated expenditure upon rural roads for the year is £32,376, and for the borough of Cambridge £7,401, making a total of £39,777.

Colchester T.C.—With reference to the proposal of the Road Board to construct a road across the Abbey Field, the Parliamentary and Footpaths Committee express the opinion that a proper footpath should also be made.

Dublin T.C.—The city council on Friday last passed a resolution in favour of widening Earl-street by 14 ft.

East Grinstead R.D.C.—The surveyor, Mr. C. Turton, has been instructed to obtain an estimate for converting a steam roller into a traction engine, and also the cost of two carts, for the purpose of hauling road materials.

East Molesey U.D.C.—The surveyor, Mr. J. Stevenson, has been instructed to offer the council's tumbler cart for the Army in France, provided the council are repaid the cost of replacing it. With reference to a request for the council's men to take up

road service in France, it was reported that all the workmen are over military age.

Felixstowe U.D.C.—It has been agreed to purchase 20,000 gallons of tar from the gas company for road tarring, with the option of a further 5,000 gallons at 49s. 6d. per ton nett.

Folkestone T.C.—The repair of Canterbury-road has been the subject of a conference between the borough surveyor and the county surveyor.

Littlehampton U.D.C.—The purchase of 85 tons of flints at a price not to exceed 5s. 9d. per ton has been approved, the material to be used in Selborne-road and Church-street. The council have concurred in the surveyor's suggestions as to control and hours of the men, as the council had now left the management and control of the workmen in his hands.

Luton T.C.—The county council will be asked to contribute to the cost of the proposed widening and improvement at Amen-corner, Church-street.

Manchester T.C.—The cleansing department, the *Manchester Guardian* states, has been handicapped by the absence of labour in dealing with the snow. In ordinary times there are 500 men employed on the streets; to-day only half that number are on the books, and many of these are new and elderly men. Casual labour used to be abundant at the time of a snowfall, the number of applicants often reaching a thousand. On one day not a single man applied for work. The department before the war employed seventy orderly boys for collecting litter, tram tickets, and rubbish. Only one boy is left, and he is partly a cripple. So it is then that the squeegee for cleaning the pavement is now seldom seen.

Paddington B.C.—The annual estimates include a proposed expenditure of £8,400 for repaving Eastbourne-terrace from Bishop's-road to Praed-street.

Scarborough R.D.C.—The surveyor, Mr. J. A. Iveson, has been instructed to arrange a conference with representatives of the Sherbur Rural District Council on the subject of the proposed new road between Cayton and Folkton.

Teddington U.D.C.—Mr. M. Hainsworth, the surveyor to the council, has been authorised to whiten the bases of all the electric street standards, the consent of the tramway company having been obtained.

Westhampnett R.D.C.—The council have approved a report by the Highways Committee stating that, from particulars furnished by the surveyors, it was found that approximately 4,150 cub. yds. of material which the council had agreed to purchase under the estimates approved for the year ending March 31, 1917, remained undelivered at date, and that of the material already delivered to the council's depots the surveyors estimated that upwards of 5,000 cub. yds. would remain unused at the close of the present season's repairs owing to the difficulties experienced in obtaining the necessary labour. Having regard to existing labour conditions, and the probability of further restrictions, the committee were of opinion that the estimates for the ensuing year should be strictly limited to the actual amount to be expended by the council in respect of the year ending on March 31st next, and therefore recommended that the surveyors be directed to prepare and limit their estimates accordingly. The committee further recommended that, provided the necessary arrangements could be made, the whole of the highways previously treated with tar should again be so treated during the ensuing summer.

West Sussex C.C.—The Roads and Bridges Committee have been authorised to purchase a portable tar-macadam mixing plant at a cost not exceeding £220, and a grit-distributing machine at a cost not exceeding £30.

Winchester R.D.C.—The council have received £1,000 from the Road Board towards the cost of road maintenance.

SEWERAGE AND SEWAGE DISPOSAL.

Herts C.C.—It has been decided to construct a culvert at Clapgate Ford, at an estimated cost of £200.

Lincoln T.C.—The borough surveyor, Mr. R. A. MacBrair, has received instructions to submit particulars of any sewerage works that may be included among the schemes to be carried out after the war.

Whitefield U.D.C.—The Local Government Board have intimated that one of their inspectors will visit the district in connection with the application of the council for a loan of £960 for an ejector pit and electrical machinery.

WATER, GAS, AND ELECTRICITY.

Keighley T.C.—The Electricity Committee recommend the town council to make application for a loan of £2,000 for an extra high-tension cable.

Leeds T.C.—The Electricity Committee recommend that a loan of £17,128 should be obtained for electricity plant.

Newport (Mon.) T.C.—A report is being prepared on the sinking of the trial holes at Talybont, where it is proposed to construct a new reservoir.

Perth T.C.—The effort to obtain an augmented supply by the sinking of artesian wells has not, thus far, been successful. A well has been sunk at the waterworks to a depth of fully 200 ft., but rock has not yet been reached. The contractor has been asked to submit an offer for boring an additional 50 ft.

Swindon T.C.—The town council have approved a number of proposals submitted by the borough engineer, Mr. H. J. Hamp, for the improvement of the water supply.

Torquay T.C.—The units generated at the electricity undertaking during the past year showed an increase of 6·47 per cent on the previous year's output.

MISCELLANEOUS.

Holywell R.D.C.—There was submitted recently a joint report of the Holywell inspector and medical officer as to the effect upon the sanitation of Greenfield valley, through which the stream from St. Winefride's Well used to run, of the drying up of the waters of that famous shrine. It was pointed out that when the pools in the valley became stagnant in dry weather a nuisance might arise, and it was suggested that there should be a joint conference between the council and the Holywell Urban Council, which would be productive of more good than separate action of the two authorities. It was decided to defer the matter until the arrival of the report of Dr. Manley, of the Local Government Board, who recently made an inspection of the district.

Newhaven R.D.C.—Delegates have been appointed to attend a conference called by the Rottingdean Parish Council to inquire into and deal with the question of coast erosion between Rottingdean and Brighton.

FOR OTHER ADVERTISEMENTS
See End of Paper.

TWICKENHAM URBAN DISTRICT COUNCIL.

CONTRACTS.

The above-named Council hereby invite Tenders for the undermentioned Goods or Materials for a period of one year from the 1st April next:—

(1) Broken Granite; (2) Shingle, Flints, Gravel and Sand; (3) Granite Kerb, Channel and Quadrants; (4) Granite Cubes and Setts; (5) Portland Cement; (6) Steam Coal and Rough Slack; (7) House Coal and Coke; (8) Forage; (9) Oil and Colourman's Goods; (10) Iron Castings; (11) Street Gullies and Drain Pipes; (12) Tar-slag Macadam; (13) Tar-paving.

Forms of Tender and Specification for the whole of the above may be obtained upon application to Mr. Fred. W. Pearce, F.S.I., Surveyor to the Council, Town Hall, Twickenham.

Sealed Tenders, endorsed "Tender for ——," are to be delivered to me by hand, or by registered post, on or before noon on the 2nd day of March, 1917.

The Council do not bind themselves to accept the lowest or any Tender, and any person whose Tender may be accepted may be required to enter into a proper Contract, with, if required, two sureties to be approved by the Council.

The Tenderer whose offer is accepted shall be held to have bound himself to an agreement, and may be compelled to carry out the obligations arising from his Tender, even though he may not have signed a formal Contract.

(By order)

H. JASON SAUNDERS,
Clerk to the Council.

Town Hall,
Twickenham.
February 14, 1917. (3,312)

PERSONAL.

Mr W H Matthews Jones, city surveyor of Chester, has been elected a member of the Institution of Civil Engineers.

Mr J S Pickering, borough surveyor and water engineer of Cheltenham, has had his salary increased from £600 to £700 per annum.

Mr R E H Heenan, of the firm of Heenan and Froude, Limited, Worcester, has been elected an associate member of the Institution of Civil Engineers.

Mr S Hutton, surveyor to the Exmouth Urban District Council, is to receive £150 a year from the council while on military service, with a corresponding reduction in the event of his Army pay being increased.

Mr W P Robinson, one of the county surveyors of Devonshire, has received a commission in the Army, and Mr. W. J. Simpson, formerly surveyor at Honiton, has been appointed to act during Mr. Robinson's absence.

Lieut.-Col. Blackwell, county surveyor of Cambs, has received the hearty congratulations of the county council upon the honour conferred upon him by His Majesty the King in his appointment to be a companion of the Distinguished Service Order.

Dennis Hallinan, a workman in the borough engineer's department, Camberwell, who is now a sergeant in the 6th Royal Irish Regiment, serving in France, has been awarded the Military Medal. Hallinan has received the congratulations of the borough council upon achieving this distinction.

Mr Lansdown, assistant surveyor to the Hinckley Urban District Council, has been called up for Army service. The surveyor, Captain E. H. Crump, is also away on military service. Meanwhile the business of the department will be kept going by Mr. W. Johnson and Mr. A. Jeffcoate, members of the council.

Mr. E. R. L. Henderson has been appointed acting engineer, surveyor and waterworks manager to the Abertillery Urban District Council during the absence of Mr. Lionel D. Lewis, who has taken up road construction work in France. Mr. Henderson has for the past four years been deputy surveyor at Abertillery.

Mr. Moynihan, assistant borough surveyor of Dublin, and his staff, are warmly complimented by the *Freeman's Journal* upon their efforts to maintain the regular water services during the recent frost. "No matter what the hour," the writer states, "they have responded readily, and but for their prompt steps the wastage of water would have been greater."

Mr Fred. C. Uren, the surveyor to the Aldershot Urban District Council, has contributed largely to the literature of waterworks engineering, and his recent paper before the Institution of Civil Engineers of Ireland is a notable addition to his writings on the subject. He is the author of "Waterworks Engineering," a book of incalculable value to students in acquiring the all-important knowledge of details of actual construction. Too often the writers of such books are content to assume that their readers already have some acquaintance with the subject, and fundamental principles and points of daily practice that can only be acquired from actual experience are not mentioned. In his book Mr. Uren has endeavoured—and with a considerable amount of success—to repair this omission, and gives in detail, from his own practice and that of other engineers, numerous illustrations and examples of small and large undertakings, from their incipient stages to the completed work.

Colonel Brotherton, of Leeds, chairman of Messrs. Joseph Crosfield and Sons, Limited, chemical manufacturers, who have works at Leeds, Birmingham, Liverpool, Warrington, Widnes, Sunderland, Middlesbrough and Glasgow, has invested £500,000 in the War Loan. Colonel Brotherton was Lord Mayor of Leeds when war broke out, and his large subscription to the War Loan may be regarded as a fulfilment of a promise he made to the City Council to give all the financial support in his power to the Government in the prosecution of the war. The son of a Lancashire cotton manufacturer, he was born at Manchester, educated at Owens College, and began his commercial business career at Wakefield nearly forty years ago. He was elected as representative of Wakefield in Parliament in 1902 when his opponent was Mr. Philip Snowden, and at the December election of 1910 he was defeated by Mr. A. H. Marshall. He was Mayor of Wakefield in 1902. He is honorary colonel of a Leeds battalion, in the raising of which he took a leading part during his Lord Mayoralty, and has been a generous supporter of the various war funds which he opened in 1914.

Mr. Stephen A. Bennett, whose appointment as county surveyor of Monmouthshire has now been confirmed, is a native of that county, and is thirty-eight years of age. He has been rejected for active service in the Army. He has passed the examination of the Associate Membership of the Institution of Civil Engineers, also the Professional Associate and Fellowship diploma examinations of the Surveyors' Institution. He has been in the service of the county council for ten years, and was appointed deputy surveyor in 1913. His professional training commenced at Pontypool, in 1895, where he spent a period of four years as pupil to Mr. D. J. Lougher, architect, surveyor and civil engineer. At the close of his pupilage he joined, as surveyor, the engineering staff of the Lancashire and Yorkshire Railway, under Mr. W. B. Worthington, B.SC., M.INST.C.E., chief engineer, and was appointed

Mr. Stephen A. Bennett,
New County Surveyor of Monmouthshire.

assistant resident engineer for the Brighouse, Heaton Lodge and Mirfield contracts. His subsequent position, in 1903, was that of chief assistant to Major H. F. Stephens, ASSOC.M.INST.C.E., of Tonbridge, for whom he prepared Parliamentary schemes for new railways and bridges in Kent, Devon and Cornwall. He was engaged as engineer to Messrs. Gates & Hogg (public works contractors), Doncaster, in 1904, for the Dearne Valley new railway, from Thurnscoe and Denaby, Yorkshire. His London experience was gained in 1905, under Messrs. R. W. Blackwell & Co., who were at that time contractors for the new conduit tramway and street widenings from Camberwell Green to Crystal Palace-road, London, S.E. In this contract was included the lowering and reconstructing of Dog-kennel-hill, Dulwich.

OBITUARY.

Mr. Thos. Salmond, ex-chief engineer of Belfast Harbour, and formerly assistant engineer to the Clyde Navigation Trust, died at Belfast on Saturday.

We regret to learn from the *Hereford Times* that the worst fears of his friends have been fulfilled in regard to Sapper R. Dunkeld, Royal Engineers, who up to the time he joined the Army was surveyor for the Dore district of Herefordshire. He was very seriously wounded in action on the Western front some four weeks ago, but the doctors had hope of his recovery, even though his condition was precarious. Our contemporary has, however, since received from his friend Corporal F. Britten, his predecessor at Dore, the sad tidings that Mr Dunkeld succumbed to his injuries on January 26th; complications arose necessitating a further operation, after which he sank. The deceased soldier, who is a Scotsman was only 26 years of age. He was appointed surveyor of Dore district just over two years ago.

PUBLIC AUTHORITIES AND THE CONTROL OF STREET ARCHITECTURE.

By Arthur F. Wickenden, A.R.I.B.A., P.A.S.I.,
Deputy City Building Surveyor, Birmingham.

The artistic development of our cities and towns was, at a period not so very remote, a question which appeared to be only of interest to those intimately connected with the practice of the arts, and the subject rarely advanced beyond the limitations of an excellent topic for endless papers and discussions at architectural conferences and similar gatherings. To-day the lay criticisms of architectural works so frequently heard expressed or met with in newspapers are conclusive evidence that we, as a nation, are at least beginning to show a greater appreciation of beauty in our surroundings. This welcome indication is doubtless one of the first fruits of the artistic education now brought within the reach of the masses by our art and technical schools, and if zealously fostered is full of promise for the future.

The man in the street, instead of being content to gaze upon pictures or read about the architectural beauties of other lands, is becoming desirous of realising them in his own home and country.

The Housing and Town Planning Act of 1909, whatever else can be urged for or against it, has certainly made it possible for future towns to be developed upon artistic principles, but under the present state of affairs the improvement of our existing cities and towns not within town-planning areas is greatly hindered by the lack of any authoritative artistic jurisdiction. The question of public control of street architecture is bristling with difficulties, but, in spite of the fact that we are essentially a freedom-loving people, and like to feel at liberty to do what we please with our own property, the need of some form of control is now admitted by the majority of those qualified to express an opinion in the matter. We have Acts of Parliament and by-laws enough and to spare in the judgment of many who come into collision with them to ensure the safe construction and sanitation of all buildings, but no legislative protection against flagrant violation of recognised canons of good taste or architectural principles, so that the work of incompetent and untrained designers may go practically unchallenged, excepting in the case of the limited powers exercised by certain landowners and corporations acting as freeholders of surplus lands acquired in carrying out street improvements. Even these powers are often not used to the utmost, owing to a keen desire to dispose of awkward-shaped sites.

That an intelligent supervision should be exercised over civic design would therefore appear evident, but the confronting problem is as to the extent and nature of such control.

GOOD AND BAD ARCHITECTURE.

While it is quite impossible to give a definite reply to the question, "What constitutes good or bad taste?" at the same time the answer certainly is not that it is entirely a matter of opinion. There are laws in art.

Ruskin, in his "Stones of Venice," writes: "No man can speak with rational decision of the merits or demerits of buildings: he may with obstinacy; he may with resolved adherence to previous prejudices; but never as if the matter could be otherwise decided than by majority of votes, or pertinacity of partisanship. I had always, however, a clear conviction that there was a law in this matter; that good architecture might be indisputably discerned and divided from the bad; that the opposition in their very nature and essence was clearly visible; and that we were all of us just as unwise in disputing about the matter without reference to principle as we should be for debating about the genuineness of a coin without ringing it."

It is quite obvious that to place any hard and fast restrictions upon the details of the design of individual buildings would be absolutely fatal to the development of architectural character or to the hope of ever producing a work of genius.

The extent of any artistic control vested in public authorities should be strictly limited to the general problems of street arrangement, collective architecture, scale, alignment and environment of buildings, and the preparation of the setting to receive the separate works designed only by properly-trained and qualified architects. For example, the controlling authority should determine whether in a street picturesque charm should be gained by the random irregularity of building line and façades, or whether dignity should be attained by deliberate symmetrical planning and the due uniformity in the design of elevations.

NATURE OF JURISDICTION.

The subject of the nature of the jurisdiction largely resolves itself into the question of whether the controlling power should be in the hands of an individual or of a committee or board of control.

The chief argument in favour of the former is that true art is the product of an individual rather than of a committee. Those who advocate corporate power insist that any scheme involving the control of one man, however brilliant he might be, would lead to an undesirable uniformity of style.

I am of opinion that the most likely successful solution of the problem would be the appointment by the various local authorities of consultative committees composed of architects and artists of repute, and presided over by a chairman who was neither an architect nor artist, and who would thus be comparatively free from narrow prejudices in favour of any particular style or school of design, but who should be a man of recognised education and refined taste, and of sufficient business ability to weigh the different opinions of his expert colleagues. A schedule of the principal streets of the city or town should be prepared, and plans and elevations for all buildings which it was proposed to erect in any of these streets should be submitted for the consideration of this advisory committee, who should, after conferring with the architects concerned, report to the city or town council as to any suggested modifications in the design.

The local authorities should be empowered, if necessary, to enforce any of the amendments thus recommended before sanctioning the erection of the building.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

SOUTH WALES DISTRICT.

A general meeting of the members of the South Wales District will be held at the Gwyn Hall, Neath, at 4 p.m. on Saturday, February 24th.

AGENDA.

1. To read minutes of previous meeting.
2. To nominate district representative, district chairman, and hon. district secretary for the ensuing year.
3. To make arrangements for spring and summer meetings.
4. To consider circular from Mr. O. Claude Robson in reference to the Orphan Fund.
5. An informal statement of work required for initial stage of a town planning scheme, by Mr. D. M. Jenkins, Assoc.M.Inst.C.E., borough engineer, Neath.
6. Any other business.

H. Alex. Clarke.
Hon. District Secretary.

Briton Ferry.

A Glossary of Road Terms. By H. Percy Boulnois, M.Inst.C.E. St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C. Price 2s.—Mr. Boulnois has achieved far more than he may imagine by this production of his pen. He set out to standardise the nomenclature of road terms; in addition he has made a valuable addition to English literature. To the untutored it is like reading a new language; Mr. Boulnois says it isn't anything like "complete." At any rate, it is a valuable *vade mecum* which no one has attempted before.—*Portsmouth Times.*

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—February 17th.—Chatham Town Council. £200—£250.—Mr. J. Holgate, medical officer of health, Town Hall.

CHARGE ENGINEER.—February 19th.—Hood Urban District Council. £120-£150 a year.—Mr. A. H. Shaw, engineer and manager, Electricity Works, Ilford.

SURVEYOR.—February 19th.—Dartford Urban District Council. £120 per annum. Mr. W. Robinson clerk, 17 Regent-street, Barnsley.

ENGINEER.—For road-making, water supplies, drainage, and buildings.—Box No. 7,996, care of A. J. Wilson & Co., Limited, 154 Clerkenwell-road, London, E.C.

STOREKEEPER.—Sheffield Corporation Water Department.—Mr. William Terney, general manager, Water Department, Town Hall, Sheffield.

DESTRUCTOR WORKS FOREMAN.—Beeston Urban District Council.—Mr. G. F. Grimwood, engineer and surveyor, Public Offices, Beeston, Notts.

MUNICIPAL CONTRACTS OPEN.

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Buildings.

BOURNEMOUTH.—February 19th.—For taking off existing roof and constructing new roof and other works at Branksome Lodge, for the corporation.—Mr. F. P. Delamore, borough engineer and surveyor, Municipal Offices.

DERBY.—February 20th.—For an extension to the electric power station, for the corporation.—Mr. J. Ward, borough surveyor, Babington-lane, Derby.

MANCHESTER.—February 21st.—For the excavation of foundations for cooling tower tanks, for the Electricity Committee.—Mr. F. E. Hughes, secretary Electricity Department, Town Hall, Manchester.

OLDHAM.—February 21st.—For the erection of a verandah and other works, for the Tramways Committee.—The Borough Surveyor.

HAMMERSMITH.—February 23rd.—For alterations to certain properties in Scrubb's-lane, for the borough council.—Mr. H. Mair, borough surveyor, Town Hall.

LOUTH.—February 28th.—For the erection of bathrooms at the county infirmary.—Mr. V. J. O'Connell, architect, Earl-street, Dundalk.

TETBURY.—February 28th.—For the erection of an engine-house, pump-house, gas-producer house, and other works, for the urban district council.—Mr. H. J. Weaver, superintending engineer, Northgate Mansions, Gloucester.

NORWICH.—March 1st.—For general repairs to a certain property, for the corporation.—Mr. A. E. Collins, city engineer, Guildhall, Norwich.

SHEERNESS.—March 14th.—For the construction of pumping station buildings and other works, for the urban district council.—The Water Engineer, Trinity-road, Sheerness.

Engineering: Iron and Steel.

GLASGOW.—February 19th.—For the supply of gas-coolers and grease pot for the corporation.—Mr. A. Wilson, 45 Johnstone-street, Glasgow.

PONTYPRIDD.—February 26th.—For the supply of cast-iron pipes, and specials, stopcocks, and fire hydrants, for the joint water board.—Waterworks Superintendent, Waterworks Engineering Office, 27, Gelliwastad-road, Pontypridd.

HARROGATE.—March 5th.—For the supply at the electricity works of a by-product steam boiler, overhead coal bunker, coal conveyer, and structural steelwork, for the corporation.—Mr. G. Wilkinson, borough electrical engineer, 33 Swan-road, Harrogate.

MANCHESTER.—March 7th.—For the supply and erection of a coal-conveying plant and suction ash plant, for the electricity committee.—Mr. F. E. Hughes, secretary Electricity Department, Town Hall, Manchester.

Mechanically Propelled Vehicles.

MANCHESTER.—February 19th.—For the supply of one or more motor street-sweeping machines, for the Cleansing Committee.—Mr. R. Williamson, superintendent, Cleansing Department, Town Hall.

Roads.

SOUTHAM.—February 19th.—For the supply of about 3,000 tons of granite and 250 tons of best blue broken slag, for the rural district council.—Mr. H. Pickering, surveyor, Pickering, Southam, Warwickshire.

TOWCESTER.—February 19th.—For the supply of granite, for the rural district council.—Mr. W. Sheppard, surveyor, The Workhouse, Towcester.

POOLE.—February 20th.—For the supply of granite and basalt for the corporation.—Mr. S. J. Newman, borough surveyor, Municipal Offices, Poole.

WANSTEAD.—February 21st.—For the supply of cartage and team labour, for the urban district council.—Mr. B. Blewitt, clerk.

BOLSOVER.—February 21st.—For the supply of granite, limestone, slag, basalt, tarred limestone, tarred slag, refined tar, pitch, kerb, channel, sand, and stoneware pipes, for the urban district council.—Mr. J. E. Wardle, town surveyor, Council Offices, Bolsover, near Chesterfield.

SPALDING.—February 21st.—For the supply of granite and slag for the rural district council.—Mr. H. S. Maples, clerk, Spalding.

SALE.—February 21st.—For the supply of flags (including concrete), kerbs, grit setts, macadam, granite chippings, lime and limestone chippings, earthenware pipes, junctions, bends and gullies, for the urban district council.—Mr. W. Holt, engineer and surveyor, Town Hall, Sale.

HODDESDON.—February 21st.—For the execution of street watering for the urban district council.—Mr. W. H. Flood, surveyor, High-street, Hoddesdon, Herts.

ADWICK-LE-STREET.—February 21st.—For scavenging and emptying privy middens, for the urban district council.—Mr. G. Gledhill, surveyor, Council Offices, Adwick-le-Street, Yorks.

KETTERING.—February 22nd.—For the supply of granite, slag, and tar macadam for the rural district council.—The Surveyor, Market-street, Kettering.

WHEATENHURST.—February 22nd.—For the supply of stone and hauling, for the rural district council.—Mr. R. E. Stuart, clerk, Bedford-street, Stroud.

BRIDGNORTH.—February 22nd.—For the supply of granite and slag, for the rural district council.—Mr. F. Richards, surveyor, Council Offices, Bridgnorth.

MARPLE.—February 23rd.—For the supply of granite macadam and chippings, Macclesfield macadam and chippings, 6-in. grit stone setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

DENBIGHSHIRE.—February 24th.—For the supply of roadstone, tar-macadam, and tar-topping, for the county council.—Mr. E. W. Jones, county surveyor, Wrexham.

ROTHERHAM.—February 24th.—For the supply of granite slag and tarred macadam, for the rural district council.—Mr. R. Bradbury, district surveyor, Imperial Buildings, Rotherham.

KEYNSHAM.—February 26th.—For the supply of granite slag, tarred macadam, and limestone, for the rural district council.—Mr. J. Johnson, district surveyor, Surveyor's Office, Keynsham, Somerset.

BREDBURY AND ROMILEY.—February 26th.—For the supply of setts, macadam, and other highway materials, for the urban district council.—Mr. Albert Plunkett, surveyor, Council Offices, Schoolbrow, Romiley.

EAST RETFORD.—February 26th.—For the supply of granite, slag, tar macadam, and refined tar, for the rural district council.—Mr. Thomas Henry, surveyor, Market-square, Retford.

LICHFIELD.—February 26th.—For the supply of granite, slag, chippings, carting, tools, and oils, for the rural district council.—The Surveyor, Council Offices, Station-road, Lichfield.

MARYLEBONE.—February 26th.—For slopping for the year, commencing April 1st, for the borough council.—Mr. J. P. Waddington, borough surveyor, Town Hall, Marylebone, London, W.

LEYTON.—February 27th.—For watering, cartage, and horse hire, for the urban district council.—Mr. L. H. Essex, surveyor, Town Hall, Leyton, Essex.

BARTON-UPON-IRWELL.—February 27th.—For the supply of setts, kerbs, macadam, flags, limestone chipping, sanitary pipes, and road brushes, for the rural district council.—Mr. A. H. Mountain, surveyor, Council Offices, Patricroft, Lancs.

CHESHIRE.—February 28th.—For the supply of macadam, tar-macadam, and chippings, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

CHESHIRE.—February 28th.—For the supply of refined tar, Tarvia, or Tarco, for the county council. —Mr. W. Holland, county surveyor, The Castle, Chester.

CAMBS.—February 28th. For the hire of steam rollers, for the county council.—Mr. H. H. Dunn, acting county surveyor, County Hall, Cambridge.

DISS.—February 28th.—For the supply of 530 tons of 2-in. and 2½-in. granite, 90 tons of 1½-in. and 1¾-in. granite, 70 tons of ¼-in. clean chippings, and 65 tons of ¾-in. dust, for the urban district council.—Mr. Alfred Cooper, surveyor, The Terrace, Diss.

BURNLEY.—February 28th.—For the supply of broken granite, limestone, macadam, shovels, spades, brushes, earthenware pipes, flags, kerbs, channels, grit setts, cast-iron gully grates, and manhole covers, for the rural district council.—Mr. H. Pritchard, surveyor, 18 Nicholas-street, Burnley.

EXETER.—February 28th.—For the construction of 1,000 super. yards of pitch grout macadam road, for the corporation.—Mr. T. Moulding, city engineer and surveyor, Exeter.

EASINGTON.—February 28th.—For making up and paving with slag certain private roads for the rural district council.—Mr. J. G. Heslop, highway surveyor, Castle Eden, Durham.

LONDON.—March 1st.—For the supply of Channel Island granite, Channel Island granite siftings, Farnham gravel, Kentish flints, cockle-shells, red-pit sand, screened Thames sand, and Kentish rag, for the Commissioners of Works.—The secretary, H.M. Office of Works, Storey's-gate, London, S.W.

WARDLE.—March 1st.—For the supply of granite macadam, tar macadam, flags, setts, kerbs, sanitary pipes, brushes, and team labour, for the urban district council.—Mr. J. D. Hurst, clerk, Council Offices, Wardle, Lancs.

BARNSLEY.—March 1st.—For scavenging and bell cart work, for the rural district council.—Mr. D. Thompson, sanitary inspector, 17 Regent-street, Barnsley.

DORCHESTER.—March 2nd. For the repair of the district roads for one year, for the rural district council.—Mr. J. J. Estridge, highway surveyor, Bleak House, Maumbury Way, Dorchester.

BEDWAS AND MACHEN.—March 2nd.—For the supply of ballast, metalling, and lamp oil, for the urban district council.—Mr. A. S. V. Taylor, Council Offices, Bedwas.

DURHAM.—March 3rd.—Tenders are invited for a second-hand No. 1 Smith hot-mixer plant for the making of tar-macadam.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

SIBSEY.—March 3rd.—For the supply of granite, slag, slag dust and chips, for the rural district council.—Mr. J. M. Simpson, clerk, 28 Wide Bargate, Boston, Lincs.

NEWMARKET.—March 5th.—For the supply of 3,000 tons of 2½-in. best broken Leicestershire granite, 3,750 tons of 1½-in., and 170 tons of granite chippings, for the rural district council.—Mr. F. J. Blackbourn, acting clerk, Deva-chambers, Newmarket.

SUNBURY-ON-THAMES.—March 5th.—For the supply of 500 tons of Guernsey, Clee Hill, Burdon Hill, or Charnwood granite, and 300 tons of slag tar macadam, for the urban district council.—Mr. H. F. Coales, surveyor, Council Offices.

STROOD.—March 7th.—For the supply of Guernsey granite spalls, broken Guernsey and other granites, quartzite, and basalt, Kentish rag, surface-picked and grubbed flints, local pit flints, and dehydrated tar, for the rural district council.—Mr. J. E. Povey, clerk, Council Offices, Stroud.

DURHAM.—March 10th.—For the supply of broken whinstone, broken limestone, broken slag, rough slag, tarred slag, tarred limestone, distilled and prepared tar, tools, team labour, cartage, and sanitary pipes, for the county council.—Mr. A. E. Brookes, county surveyor, Shire Hall, Durham.

WALSALL.—March 13th.—For the supply of broken furnace slag, broken granite, and stoneware pipes, for the rural district council.—Mr. W. P. Young, district surveyor, Council Offices, Daw End, Rushall, Walsall.

CHAILEY.—March 22nd.—For the supply of about 2,980 yds. of flints, 2,550 yds. of granite or other stone, and 60 yds. of gravel, for the rural district council.—Mr. C. Patrick, clerk, Union Offices, West-street, Lewes.

Sanitary.

LEWISHAM.—February 20th.—For the supply of horse hire and removal of house refuse, for the borough council.—Borough Surveyor, Town Hall, Lewisham, London, S.E.

FULHAM.—February 21st.—For the supply of drain pipes and scavengers' brooms, for the borough council.—Mr. J. P. Shuter, town clerk.

WAKEFIELD.—February 26th.—For work of public scavenging, for the rural district council.—Mr. W. Druce, clerk, Tetley House, Wakefield.

SMALLTHORNE.—February 28th.—For scavenging the Packmoor area, for the urban district council.—The Sanitary Inspector, Smallthorne, Staffs.

LLANDAFF.—March 1st.—For the construction of 400 yds. of 9-in. and 18-in. earthenware and cast-iron pipe sewers, with manholes, for the rural district council.—Mr. J. Holden, engineer, Park House, 20 Park-place, Cardiff.

GAINSBOROUGH.—March 3rd.—For the supply of stoneware and earthenware pipes, gullies and cast-iron pipes, for the urban district council.—Mr. S. W. Parker, engineer and surveyor, 6 Lord-street, Gainsborough.

CAERPHILLY.—March 20th.—For scavenging various districts, for the urban district council.—Mr. T. H. Richards, surveyor.

Stores.

BETHNAL GREEN.—February 19th.—For the execution of works and the supply of ballast, sand, broomheads, disinfectants, horse hire, and ironmongery, for the borough council.—Mr. A. E. Darby, borough engineer and surveyor, Town Hall, Cambridge-road, Bethnal Green, E.

DONCASTER.—February 19th.—For the supply of roadstone and setts, kerbstone, flags, slag or furnace dross, tarred slag and limestone, pitch, creosote oil and refined tar, sand and gravel, drainage pipes, blue channel bricks, bricks, cement, brooms, paints, picks and shovels, oils, paraffin, cotton wastes, and disinfectants, for the corporation.—Mr. R. E. Ford, acting borough surveyor, Mansion House, Doncaster.

WIGAN.—February 21st.—For the supply of brooms and brushes, Portland cement and lime, common bricks, stoneware pipes and gullies, pitch, creosote oil, tar, manhole and gully grates, oils, paints, grit, setts, kerbstones, channel stones, flags, gravel, chippings, macadam, granite setts, kerbs, channels and crossings, floorcloths and dusters, for the corporation.—Mr. A. T. Gooseman, borough engineer and surveyor, Municipal Offices, King-street West, Wigan.

LLANDAFF AND DINAS POWIS.—February 25th.—For the supply of mountain limestone, team labour, Clee Hill stone, tools, castings, ironmongery, earthenware pipes, and street watering for the rural district council.—Mr. James Holden, surveyor, 20, Park-place, Cardiff.

MALDENS AND COOMBE.—February 26th.—For the supply of broken flints, granite, fine gravel, tar-macadam, tar paving, Portland cement, brooms, brushes, manhole covers, gully gratings, pitch, creosote oil, distilled tar, paints, colours, leads, varnishes, oils, and sundries, for the urban district council.—Mr. James W. Johnson, clerk, Council Offices, New Malden, Surrey.

WHITEFIELD.—February 26th.—For the supply of granite macadam, setts, chippings, kerbs, flags, disinfectants, earthenware pipes, and ironwork, for the urban district council.—Mr. G. M. Denton, engineer and surveyor, Whitefield.

CLITHEROE.—March 3rd.—For the supply of wrought iron, steam tubes and fittings, ironmongery, lime, team labour, disinfectants, limestone, earthenware pipes, street gates, brushes, mortar, granite, flags, setts, pitch, and oil, for the corporation.—The Borough Surveyor.

SOUTH SHIELDS.—March 3rd. For the supply of Northumberland whinstone, Fifeshire whinstone, Aberdeen and Norwegian granite, slag, granite chippings, Caithness flags, Portland cement, cement concrete flags, cast ironwork, shovels, scavenger brooms and machine brooms, coal, coke, disinfectants, leather hose, sewer boots, jackets, sanitary pipes, paints, paint oils, glass, timber, iron, horseshoe nails, cart axles, springs, tar, pitch, oils, and general stores, for the corporation.—The Borough Engineer, Municipal Buildings, South Shields.

COLCHESTER.—March 7th. For the supply of Derbyshire stone, lime, granite kerbing, granite setts, broken granite, Kettering iron slag, tar-macadam, broken Kentish ragstone, Kentish sifted red flints, Portland cement, glazed stoneware sewer pipes, junctions, bends, traps, taper pipes and gullies, for the corporation.—Mr. H. Collins, borough engineer and surveyor, Town Hall, Colchester.

DURHAM.—March 10th.—For the supply of broken whinstone, broken limestone, broken slag, rough slag, tarred slag, tarred limestone, distilled and prepared tar, tools, team labour and cartage, and sanitary pipes, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

HEYWOOD.—March 17th.—For the supply of setts, kerbs (local stone), flags (local stone), earthenware pipes, bends, junctions, taper pipes, traps, gullies, pitch, creosote oil, limestone chippings (white), hand-broken granite and granite chippings, and Portland cement (British standard specification) for the corporation.—Mr. J. B. Nuttall, borough surveyor, Municipal Offices, Heywood.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

CAISTOR.—For the supply of about 5,000 tons of granite, about 5,400 tons of slag, about 550 tons of slag chips, and 200 tons of tar-macadam, for the rural district council.—Mr. J. Surfleet, district surveyor:—

GRANITE.

Ellis & Everard, Bardon Hall; M. Jackson & Son, Louth; Ord & Maddison, Darlington; Mountsorrel Granite Company, Mountsorrel, from 14s. to 15s. 6d. per ton at different stations.

SLAG.

Atkinson & Sons, North Kelsey, 6s. 4d. to 7s. 6d. per ton.

TAR-MACADAM.

Atkinson & Sons, North Kelsey, 14s. 7d. to 15s. 7d. per ton.

CANNOCK.—For tars-spraying and the supply of refined tar, for the urban district council.—Mr. R. Blanchard, engineer and surveyor:—

Tars-spraying.—W. Bullock, Stoke-on-Trent.
Refined Tar.—Kempson & Co., Limited, Alfreton.

DERBY.—The following tenders have been accepted:

Steam Turbine, Alternator, and Condensing Plant.—C. A. Parsons, Limited, Newcastle-on-Tyne, £12,600.
Boiler Plant.—Babcock & Wilcox, Limited, London, £6,513.
Buckets and Elevators.—Chain Belt Engineering Company, and Eastwood & Swingler, Limited, £2,500.

EASINGWOLD.—For the supply of whinstone and slag, for the rural district council:—

G. Hodgman & Sons, Limited, York
Cranlock, Allison & Co., Eaglescliffe.
Ord and Maddison, Limited, Darlington.
Monkhouse & Peart, Wearhead
F. Summerson & Co., Darlington
J. L. Smith & Co., Leeds
W. C. Clarke, Limited, Darlington.
Slag and Tar Macadam Company, Limited, Darlington
J. F. Shackleton & Co., Goole.

GRAYS THURROCK.—For the supply of 400 tons, or thereabouts, of basalt or granite chippings, for the urban district council.—Mr. A. C. James, surveyor:—

	Per ton. £ s. d
Brooks, Limited, Westminster	1 0 0
Lancaster & Bateman, Sutton Bridge	0 13 3
Ludgate and Stones, Stanton Granite Company, Ludgate	0 12 8

LEATHERHEAD.—For the supply of about 400 barrels of refined tar for the urban district council.—Mr. Sidney R. Drake, surveyor:—

TAR.

	Per gallon d.
Georgelee & Co., London	3½
F. G. Holmes & Co., Sandhurst, Kent	4¼
Gas Light and Coke Company, London	3¾
Forbes, Abbott & Lemon, Limited, Shoreham, Sussex	3½
E. Cockbeck & Sons, London	3
Leatherhead Gas Company, Leatherhead †	3½

COATING.

	s. d
Hall & Co., Epsom (per ton)	7 0
Farnham Gravel Company, Farnham, Surrey (per ton)	5 10
T. Patterson, Farnham, Surrey (per ton)	4 10

LITTLEHAMPTON.—Accepted for the supply of 14,000 gallons of tar, for the urban district council:—

Road Supply Company, 3 11/16d. per gallon.

NORFOLK.—For the supply of various articles, for the Eastern Highways Committee.—Mr. W. W. Gladwell, county surveyor:—

Tools.—Bird & Co., West Drayton; E. Langford, King's Lynn; W. R. Pollard, East Harling.
Gully Grates and Frames.—Youngs & Co., Diss.
Roadmen's Barrows.—Smith & Co., Besthorpe; C. W. Clarke, Fakenham.
Navvy Barrows.—C. W. Clarke, Fakenham; W. S. Walker, Grimston.
Hand Carts.—R. A. Dodman, North Walsham; W. S. Walker, Grimston; C. W. Clarke, Fakenham.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY.

16.—Institution of Municipal and County Engineers: South-Eastern District Meeting. 92 Victoria-street, Westminster. 4 p.m.

16.—Institution of Mechanical Engineers: Annual General Meeting, Institution of Civil Engineers, 6 p.m.

19.—Junior Institution of Engineers: Mr. R. D. West on "Some Improvements in Dealing with Trade Wastes." 7.30 p.m.

24.—Institution of Municipal and County Engineers: South Wales District Meeting at Neath.

MARCH.

23.—Town Planning Institute: Mr. W. Rees Jeffreys on "Road Construction and Improvements by Means of Town Planning Schemes." 6 p.m.

TENDERS WANTED.

CAMBRIDGESHIRE COUNTY COUNCIL.

TENDERS FOR STEAM ROLLING.

The above Council invite Tenders for the Hire of Steam Rollers for use on the main roads during the year ending March 31, 1917.

Particulars and Forms of Tender may be obtained from, and Tenders are to be delivered on or before year ending March 31, 1917.

H. H. DUNN,
Acting County Surveyor.

County Hall, Cambridge. (3,310)

ROAD MATERIALS.

The Commissioners of H.M. Works, &c., are prepared to receive Tenders for the Supply of Road Materials (Channel Island Granite, Channel Island Granite Siftings, Screened, Pea and Farnham Gravel, Kentish Flints, Cockle Shells, Red Pit Sand, Screened Thames Sand and Kentish Rag) during a period of one year from the 1st April, 1917.

Forms of Tender and all particulars may be obtained on application at the undermentioned address.

Tenders may be submitted for all the materials or for one or more kinds to be supplied at one or more of the depots.

The Commissioners do not bind themselves to accept the lowest or any Tender.

Tenders must be delivered before 11 a.m. on Thursday, the 1st March, 1917, addressed to the Secretary, H.M. Office of Works, Storey's Gate, London, S.W., and endorsed "Tender for Road Materials."

H.M. Office of Works, &c.,
13th February, 1917. (3,311)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SHEFFIELD CORPORATION WATER DEPARTMENT.

EWDEN VALLEY WORKS.

Storekeeper wanted at once. Practical experience on public works essential. Must be over military age. Apply, stating age, experience, and wages required.

WILLIAM TERREY,
General Manager, Water Department.

Town Hall, Sheffield. (3,299)

The Surveyor

And Municipal and County Engineer.

Vol. LI. FEBRUARY 23, 1917. No. 1,310.

Minutes of Proceedings.

The Vesting of Streets in Urban Districts.

It is a curious fact that the simplest expression in an Act of Parliament will sometimes give rise to complicated questions. An apt illustration is to be found in sec. 149 of the Public Health Act, 1875, which, it will be remembered, provides that all streets being, or which at any time become, highways repairable by the inhabitants at large within any urban district shall "vest in" and be under the control of the urban authority. It appears to have been assumed at first that the effect of this enactment was to make the urban authority the absolute owners of the soil of the public streets within their district, with the ordinary rights incidental to the ownership of the soil of a public highway. It is well established that a landowner who dedicates part of his land to the public as a highway retains all rights which are not inconsistent with the public right of passage. He may, for instance, deal with the subsoil in any manner which does not interfere with the use of the land for the purpose of a highway, and he is entitled to the space above it (in the quaint old phrase, *usque ad cælum*), and can prevent anyone from carrying telegraph or telephone wires across it without his consent. But as soon as urban authorities, assuming that they possessed similar rights with respect to streets "vested" in them by the statute, began to act accordingly, litigation ensued, with the result that the courts, interpreting the expression "vest" in a much more restricted sense, rejected this assumption as unwarranted. With regard to the subsoil, it has been decided that the urban authority cannot legally construct lavatories or subways under a street (*Tunbridge Wells Corporation* v. *Baird*, [1896], A.C., 434; *London and North Western Railway Company* v. *Westminster Corporation*, [1904], 1 Ch., 759); nor can they grant a licence to traders to lay pipes for trading purposes (*Salt Union, Limited*, v. *Harvey*, [1897], 13 T.L.R., 297); nor do they acquire any right to minerals below the street. And even where an electric lighting company illegally broke up a street and laid wires about 2 ft. below the surface, the court refused to grant a mandatory injunction to compel their removal (*Battersea Vestry* v. *County of London, &c., Electric Lighting Company*, 1899, 1 Ch., 474). And as to the space above the street, although the urban authority have the right themselves to erect posts in, and to carry electric wires across, the street for the purpose of lighting their district (*Fareham Local Board* v. *Smith*, 1891, 7 T.L.R., 443), they cannot prevent telephone or telegraph companies from carrying wires across it, provided they are at such a height as to cause no appreciable danger to the traffic (*Wandsworth Board of Works* v. *United Telephone Company*, 1884, 13 Q.B.D., 904; *Finchley Electric Light Company* v. *Finchley Urban District Council*, 1903, 1 Ch., 437).

What then is the effect of the provision that the streets shall "vest in" the urban authority? Perhaps it cannot be expressed more tersely than in the following *dictum* of Lord Herschell in the Tunbridge Wells case: "It seems to me that the vesting of the street vests in the urban authority such property, and such property only, as is necessary for the control, protection, and maintenance of the street as a highway for public use." It has been put in more amplified forms in other judicial *dicta*, by collating which it appears that what is vested in the authority is what is called "the user of user"—*i.e.*, the surface of the street and so much of the subsoil and of the stratum of air above the surface as can, in any reasonable sense, be required for the purposes of the street, and considered as essential to the purposes referred to by Lord Herschell. It is true that his interpretation does not altogether shut the door upon the possibility of disputes, since cases may still arise in which opinions will differ as to what is and what is not "reasonable" or "essential." Such cases, however, will probably be rare.

* * *

Highways and Byways.

At the last meeting of the Royal Society of Arts, Mr. Lawrence W. Chubb read a paper of great interest on the subject of "Highways and Byways," with special reference to the work of the Commons and Footpaths Preservation Society, of which he is the secretary. The earlier part of the paper consisted of a statement of the main principles of the law in regard to dedication, and an account of the origin and development of our present system of highway administration. All this, however, was introductory to the main theme—namely, the protection of public rights of way (and particularly from whist from obstruction. Our readers are, of course, familiar with the principle that when once a [illegible] has been dedicated to the public it cannot lawfully be closed by Act of Parliament or by an Order of the justices made under the Highways Act, 1835. Long experience has shown however that illegal obstructions usually be [illegible] use of common prudence. These infringements of the public right can be combated in two ways, namely, by action

[illegible] part of a highway authority under [illegible] 20 of the Local Government Act, 1894, to [illegible] section of the public [illegible] one or more individuals [illegible] The Commons and Footpaths Preservation Society has a long and honourable record of work in assisting in both these directions, and as the result of its experience has met with almost every form of difficulty which can retard the growth of an effective association of public [illegible]. Chief among these difficulties is undoubtedly the [illegible] of legal proof of the right in view of the present state of the law as to dedication, and the conflicting views taken by different judges in cases raising similar questions of fact. The law as to implied dedication does not rest upon any prescriptive title acquired by the public after a definite period of user. On the contrary, any period of user is sufficient, so long as in all the circumstances it is sufficient to enable a judge or jury to infer from it an intention to dedicate. Apart from the rule that there can, generally speaking, be no dedication except by a freehold owner often operates very hardly as against the public, for if it can be shown that for the whole period of public user, no matter how long it may have been, the land over which an alleged highway passes has been in strict settlement, no dedication can be implied during that period. Many judges have felt themselves to be rigidly bound by this rule, while [illegible] others, however, have got over the difficulty by presuming dedication [illegible] period of settlement. This want of uniformity is very deplorable, and there is little doubt that the uncertainty thereby created has prevented many an attempt to establish a public [illegible] which might otherwise have been made.

It is not surprising, therefore, that there is a widespread feeling among those who are chiefly interested that the proof of public rights of way should be placed upon a more equitable and sure basis. For some years past the Commons and Footpaths Preservation Society has been pressing for the passage through Parliament of a Bill which provides that, where an estate is in the hands of an actual freeholder, open and notorious public user as a path for twenty years shall be sufficient to raise the presumption of dedication. If, however, the land is entailed, or subject to any other restrictive disposition, it is proposed that the period of user shall be forty years. The Bill has met with little opposition and has passed through the House of Lords in the Legislature on more than one occasion. Up to the present, however, it has not succeeded in passing both Houses in the same session and so has never become law. We join in the hope expressed by Mr. Chamb[illegible] that, with the return of more normal times, Government facilities may be given for the passing into law of a measure on the lines indicated.

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Edinburgh Water Trustees and the Aggrieved Plumbers.

That municipal trading has a [illegible] both as regards financial aspect and responsibility has just been illustrated in a case that was heard recently in the Scottish Court of Session. Certain master plumbers in Edinburgh brought the action to have it declared that the Edinburgh and District Water Trustees were not entitled to engage in the trade or business of plumbing and in particular, either by themselves or their agents, were not entitled to furnish, or to contract to furnish any pipes or other articles connected with the supply of water to the dwelling-houses or premises within the district of the Trustees. It appeared that the Trustees were requested by the military authorities to provide a water supply to huts erected on the Castle Esplanade for the accommodation of troops. In connection with the work [illegible] the War Office [illegible] for the execution of the whole plumbing work, this being, of course, work ordinarily performed by plumbers. The defence was that the work was done at the order of the War Office in the national interest, and that in respect of the Defence of the Realm Regulations the pursuers (plaintiffs) were not entitled to the interdict sought for. The decision of Lord Ormidale left no room for doubt with respect to the legal rights or wrongs of the point at issue, though it is clear that his lordship entertained the opinion that morally the trustees were justified in what they had done. With the exception of houses of an annual value not exceeding £10, the trustees, it was laid down, neither explicitly nor inferentially were entitled to engage in ordinary and original or initial plumbing work at or inside the premises which were being supplied with water. The powers of the trustees, moreover, were not to any extent enlarged by the provisions of the Defence of the Realm Regulations. Their duty concluded when they brought the water up to the premises, "and they could not, as an authority supplying water, be compelled or agree to provide and fit the apparatus necessary for its distribution and disposal within the premises." His lordship sympathised with the view that such work could be done by the trustees with greater dispatch and convenience to the military authorities than by any one else, "and it was to be regretted that in existing circumstances the pursuers should have deemed it expedient to take exception on technical grounds to work which appeared to have been in the public interest, and without any possibility of material detriment to the interests of the pursuers either in the present or in the future.

It would seem that the trustees interpreted their duty in the imperial and imperative sense, and if so they will receive the sympathy of the ordinary citizen, to whom expedition and public convenience would appeal strongly in these abnormal times. Technically, however, they are placed out of court, and must, of course, bear the consequences.

* * *

L.C.C. Tramways Reorganisation.

At the last meeting of the London County Council some very remarkable figures were given in regard to the development of the tramway undertaking since the first complete year—1871, the year ending March 31, 1900. Between that date and March 31, 1914, the track mileage had increased from 24 miles to rather over 144; the number of car miles run had increased fivefold; the number of passengers carried annually had reached the colossal total of 523,000,000; and the annual revenue had reached a total considerably in excess of £2,250,000 sterling. These figures were stated in a report of the Highways Committee, in which specific proposals were put forward for a reorganisation of the department. The present organisation, it was pointed out, had grown naturally with successive additions to the system, and the necessity for some review had become manifest in consequence of the growth in working costs and the increasing complexity of Metropolitan passenger traffic operations. The principle recommended by the committee for reorganisation was that of devolution, and, in view of the magnitude of the undertaking, this certainly seems to be the right line to take. Hitherto the chief officer has been compelled to devote much time and attention to ordinary executive business, while the division of the department into ten sections has also rendered necessary great efforts in co-ordination. For these reasons he has been hampered in dealing with such important matters as the development and improvement of the system, and the consideration of larger questions of tramway working and policy. Under the proposed new scheme the department will be

divided into five branches—viz.: (1) Traffic branch; (2) electrical branch; (3) rolling-stock branch; (4) permanent way branch; (5) general branch, and the devolution by the chief officer of tramways of duties and responsibilities to the higher subordinate officers upon general lines will thus become possible. The reorganisation will involve a number of new appointments, particulars of which will be found in another column. Criticism will no doubt be made in certain quarters that the salaries to be paid are excessive, but in view of the magnitude of the interests that are involved and the responsible nature of the duties to be discharged, we are confident that the line of true economy lies in attracting the best men available.

* * *

Municipal Officers and Military Service.

It appears from enquiries that we continue to receive that the question of the exemption of certain members of the staffs of officers of local authorities from military service is still the subject of some doubt in the minds of those concerned. As an example of the kind of question that is being asked, we may perhaps mention the following, which was put to us: An official holding the joint appointments of engineer and sanitary inspector had a staff before the war of three assistants; two of these joined the Colours in 1914, and the remaining one has, up to the present, been the subject of conditional exemption. He has now, however, been given a final two months, at the expiration of which he will have to join up. It is pointed out to us in this case that in the official list of certified occupations appears an entry "officials on the administrative or technical staffs of Local Government authorities." As we pointed out, however, some time ago, the entry in the list of certified occupations to which we have just referred is qualified by a statement that only those men to whose reservation the military representative agrees are to be treated as in a certified occupation. Further, from a circular of instructions which was issued in March of last year for the guidance of tribunals, it is clear that "administrative staff" is intended to include persons holding responsible administrative positions (not, for instance, ordinary clerks), and "technical staff" is intended to include officials such as surveyors who hold their positions in virtue of definite professional qualifications.

* * *

The Orphan Fund.

It appears from the letter which has been addressed by Mr. O. Claude Robson to the district secretaries that the Orphan Fund Committee of the Institution of Municipal and County Engineers has had under consideration the question of devolution with a view to securing a more widespread interest in the fund and an increase in the number of subscribers. The subject was broached by Mr. Massie at the annual meeting at Blackpool, when it was felt that some strenuous effort should be made to render the fund more worthy of the association by endeavouring to secure the sympathy and assistance of the various districts by utilising the machinery of the district committees for the purpose of increasing the number of subscribers to the fund. The Orphan Fund Committee have now decided that one or more Orphan Fund stewards be appointed in each district to advocate the claims of the fund, to promulgate its work, to solicit and collect subscriptions and donations, to investigate cases needing assistance, and to report to the secretary on all questions relating to the work of the fund. There can be little doubt that, as a result of the war, the demands on the fund will be greater than ever, and we sincerely hope that the new method of working will secure the desired results. At last Friday's South-Eastern District meeting it was suggested that a subscription might be given from the funds of the institution. If the funds would permit, this might be a desirable course, but we cannot help thinking that there might be some legal technical difficulty to prevent such a contribution being made.

* * *

A Surveyor's Salary.

At a recent meeting of the Godmanchester Urban District Council a letter was read from the surveyor applying for some temporary addition to his salary on the ground that, owing to the increased cost of living, the remuneration is not now sufficient for his needs. Upon the application a general discussion ensued, which illustrated very well the views which are taken by different types of members of local authorities upon a question of this kind. More than one member took the view that in making his application the surveyor was trying to obtain some advantage for himself at the expense of members of the community who were probably worse off. Another view that was expressed was that every one ought to feel the war, and that the surveyor would only be "doing his bit" if he withdrew his application. It is a relief to find that one member at least took a broader view of the situation, and expressed surprise that similar applications had not been received long before, not only from the surveyor, but also from other officials. For our part, we can never understand upon what ground a bonus is granted, usually without question, to workmen in receipt of a weekly wage, when as soon as an official receiving very little, if any, more ventures to ask for consideration, a storm of protest is immediately raised. In the case of which we have been speaking, not only was the application refused, but objection was taken by the member who moved the refusal to the surveyor making a statement in support of his application. The whole proceeding is hardly creditable to the authority concerned.

* * *

The Shortage of Labour.

There can be no doubt that at the present moment many of the highways in this country are suffering severely from the present shortage of labour and difficulty in obtaining material. A case in point arose recently at Shepton Mallet. At the last meeting of the rural district council the surveyor had to report that he had been unable to obtain the stone necessary for carrying out certain main road repairs, owing to the fact that the whole of the output of the local quarries was being commandeered by the War Office. Arising out of the surveyor's report on the subject, there was a general discussion, which was not without interest. Various complaints appear to have been made about the condition of the roads, and, in spite of the acknowledged difficulty in obtaining labour and material, an attempt was made to fix some blame upon the surveyor, on the ground that the roadmen ought to have more supervision. To this the very pertinent reply was made that in present circumstances it was physically impossible for the surveyor to do more work than he was doing, but that if he were provided with a motor much of the difficulty would be removed. Ultimately a special sub-committee was appointed to carry out an inspection of the roads, but it is a little difficult to see what practical result can flow from their labours unless they can make some suggestions for obtaining more readily than at present the necessary labour and material for the efficient maintenance of the roads in the district.

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Standard Specifications for Road Materials.

CRUSHED STONE, SAND, GRAVEL AND ASPHALTIC OILS.

[A committee of the Canadian Society of Civil Engineers consisting of Messrs. W. A. McLean (chairman), W. P. Brereton, F. W. Doane, Jules Duchastel, J. E. Griffith, G. Henry, Edgar James, A. F. Macallum, A. J. McPherson, Paul Mercier, W. P. Near, George Powell and C. H. Rust, have been engaged in collecting data concerning the construction of various types of roads and streets, and formulating tentative standard specifications for the guidance of engineers in the purchase of road materials. Appended is an abstract of the committee's draft of proposed specifications for crushed stone, sand, gravel and asphaltic road oils.]

The formulating of specifications for natural products such as crushed stone, gravel, and sand, which can be directly used in all localities, is impossible. In many localities the greater portion of the cost of these materials is that paid for transportation. Hence material of high quality which can be procured within short distance of the work in one locality would reach a prohibitive cost in another.

The committee has therefore endeavoured to draw up specifications which cover materials of good quality under normal commercial and natural conditions. It is recognised that in some districts these specifications as they stand will not be applicable, but the ideal striven for has been to secure a specification that may be a guide, from which specifications best suited to local conditions can be drafted.

The classifying of materials into different grades according to qualities reduces the necessity of redrafting the specifications. In localities where materials of certain grades cannot be secured economically and the nature of the work permits the use of material of inferior qualities, it will only be necessary to specify the particular grade required when the specifications for work are drafted.

The extensive use of laboratory test results may be considered inadvisable by some engineers. At the present time laboratories are not available in all municipalities, but resort to laboratory tests is rapidly growing and even at the present time tests are being conducted by some of the universities in the Dominion. It is felt that it is only a matter of time till every large municipality will submit all materials to laboratory test prior to accepting them.

The properties assigned to the different grades have been selected from the study of results of tests made under the direction of the chairman of the committee as well as from the study of the results of tests conducted by various highway organisations.

In reading the specifications it must be borne in mind that tests are for the supply of materials only. The classes of work in which the materials are to be used (unless such materials are confined only to such classes of work) are not here stated. The specifications for the construction of various types of pavements will state definitely the class, size, &c., of the materials which are to enter into the construction of the pavement.

Drafts of the specifications as considered by the members of the committee residing in Toronto were sent to all members. Where suggestions regarding changes in certain points were made these have been incorporated, but where changes of importance have been suggested these are indicated at the end of each specification in order that they may receive the consideration of the society.

The committee reports progress in the drafting of specifications for the supply of bituminous materials. The rapidly increasing use of these materials for the protection of road surfaces renders it advisable that a suitable specification be in the hands of engineers at the earliest moment.

Work has commenced on three grades of a penetration road oil, but at the same time it was realised that some work should be done on other grades of this material as well as on refined tars, &c., favoured by engineers for certain classes of work. Specifications for bituminous materials have not been issued, as it is felt by all the members of the committee, and so therefore to be considered as a provisional report only.

It is the intention of the committee that a series of annual reports be drawn up which will take into consideration the various types of pavements suggested, systems of payment and methods of inspection of materials. Following are the proposed tentative specifications:

CRUSHED STONE.

Definition.—1-1.—Crushed stone shall be bedded rock or boulders which have been broken by mechanical means into fragments of varying shapes and sizes. It shall not contain more than 10 per cent by weight of soft or friable material. Material of which the particles are coated with dirt or have the edges worn off will not be accepted.

Weathered Stone.—1-2. No crushed stone shall be accepted which shows signs of being disintegrated or reduced in quality by the action of the weather.

Crusher Run.—1-3. Crusher run shall be the product of the crusher, of which not more than 8 per cent by weight shall pass at ¼-inch opening.

Sizes of Stone.—1-4. The following schedule of sizes shall be used, with the percentages of material larger than the maximum and smaller than the minimum openings respectively, as shown. The sizes of opening shall mean the diameter of circular openings in steel or iron plates. The percentages shall be determined by weight.

The sizes of stone with the openings by which they are obtained are as follows:—

Name of size.	Max. size of opening in inches.	Max. % retained by max. size of opening.	Min. size of opening in inches.	Max. % passing minimum size of opening.
5 inch	5	3	4	8
4 „	4	3	3	8
3 „	3	3	2½	8
2½ „	2½	5	2	10
2 „	2	5	1½	10
1½ „	1½	5	1	15
1 „	1	5	½	15
½ „	½	7	¼	15

Screenings.—Screenings shall be material all of which shall pass a ¼-inch screen.

Mineral Dust.—Mineral dust shall be finely pulverised stone of which not less than 80 per cent by weight shall pass a 200-mesh screen.

Tests on Stone.—1-5. In addition to fulfilling the foregoing requirements, crushed stone shall be classed into three grades, according to qualities which shall be determined by tests conducted in a properly-equipped laboratory. The properties determined shall be: Co-efficient of wear, toughness and absorption. Material meeting the requirements of any of the grades with respect to coefficient of wear and toughness, but failing to meet the requirement with respect to absorption may, on consideration of the engineer, be classed with the higher grade.

Grades of Crushed Stone.—Crushed stone shall be classed under one of the following grades:

1-6.—Grade "A" is a rock which has a toughness of not less than 18, a coefficient of wear of not less than 14, and an absorption of not more than 0·6 pound per cubic foot.

1-7.—Grade "B" is a rock which has a toughness of not less than 10, a coefficient of wear of not less than 7, and an absorption of not more than 1·5 pounds per cubic foot.

1-8.—Grade "C" is a rock which has a toughness of not less than 7, a coefficient of wear of not less than 5, and an absorption of not more than 4·5 pounds per cubic foot.

1-9.—Grade "D" is a rock that does not meet the requirements of any of the above grades and which may be used only on consideration by the engineer.

GRAVEL.

Definition.—2-1. Gravel shall consist of naturally formed fragments of tough durable rock, well graded in size from the smallest to the largest, free from flat, elongated particles, and shall not contain more than 15 per cent by weight of soft friable material. It shall not contain an excess of clay nor

an excess of loose or adhering dust, vegetable loam or other deleterious matter. It shall be satisfactory to the engineer in all respects.

Screened Gravel.—2-2.—"Screened gravel" is gravel fulfilling the above requirements, which is screened into one or more of the sizes defined in Section 1-4 of the "Specifications for Crushed Stone."

2-3.—"Run of bank gravel" is gravel fulfilling the requirements of Section 2-1 of this specification, which shall be classed under one of the three grades shown below according to qualities determined in a properly-equipped laboratory. The properties determined shall be the coefficient of wear and the proportions of the various sizes of particles present.

The coefficient of wear shall be determined on material passing a screen having circular openings 2 in. in diameter and retained by a screen having circular opening ½ in. in diameter. The test shall be conducted in the same manner as that for determining the coefficient of wear of crushed stone. Run of bank gravel shall be classed according to the following grades:—

2-4.—Grade "A" is a run of bank gravel containing a large percentage of pebbles of igneous rocks. It shall not contain more than 5 per cent by weight of material which shall be retained on a screen having 4-in. circular openings, and not more than 45 per cent by weight of material, which shall pass a screen having ¼-in. square openings. It shall not contain more than 3 per cent by weight of clay or loam nor have a coefficient of wear of less than 14.

2-5.—Grade "B" is a run of bank gravel containing a smaller percentage of igneous rock pebbles. It shall not contain more than 5 per cent by weight of material which is retained by a screen having 4-inch circular openings nor more than 60 per cent by weight of material retained by a screen having ¼-in. square openings. It shall not contain more than 9 per cent by weight of clay or loam nor have a coefficient of wear of less than 11.

2-6.—Grade "C" is a run of bank gravel composed chiefly of pebbles of sedimentary rock. It shall not contain more than 5 per cent by weight of material which is retained on a screen having 4-in. circular openings, and not more than 80 per cent by weight of material which passes a screen having ¼-in. square openings. It shall not contain more than 12 per cent by weight of clay or loam nor have a coefficient of wear of less than 7.

2-7.—Grade "D" is a run of bank gravel which does not meet the requirements of any of the above grades, and which may be used only by written permission of the engineer.

2-8.—When so directed by the engineer, gravel shall be crushed. The material so produced shall conform to the requirements of "screened gravel" or "Run of bank gravel" as directed by the engineer.

SAND.

Concrete Sand.—3-1. Fine aggregate for concrete shall consist of natural sand, composed of hard, tough, durable particles, graded from fine to coarse. When dry, not more than 5 per cent shall be retained on a sieve having 4 meshes per lineal inch; not more than 20 per cent by weight shall pass a sieve having 50 meshes per lineal inch, and not more than 4 per cent shall pass a sieve having 100 meshes per lineal inch. It shall not contain more than 3 per cent by weight of clay or loam.

Mortar Tests.—3-2. Sand in addition to meeting the above requirements shall give a mortar strength equal to or higher than the minimum value at any of the ages shown in the following table:

Age at test.	Minimum strength of 1:3 mortar.
72 hours	1·25 times A
7 days	1·10 times A
28 days	1·00 times A

Where "A" is the strength of 1:3 standard Ottawa sand mortar specimens of same form and size made by the same operator using the same cement and the same amount of water.

The tests shall be made on mortars composed of one part Portland cement and three parts of fine aggregate or standard Ottawa sand by weight. The test specimens shall be made, stored and tested in the same manner, under approved laboratory conditions and according to recognised standards of practice. Each value shall be the average from tests of no fewer than three specimens.

Cement.—3-3. The cement used in all tests shall meet the requirements of the specifications for Portland cement of the Canadian Society of Civil Engineers, as revised in 1916.

Stone Screenings.—3-4.—Stone screenings from a hard, tough, durable rock may be used as fine aggregate by written permission of the engineer and provided it meets the requirements of mortar strength.

Sand for Bituminous Construction.—3-5.—Sand for use in bituminous pavement construction shall consist of hard, tough, durable particles. It shall not contain more than 1 per cent of clay or loam. When dry, not more than 8 per cent shall be retained on a sieve having eight meshes per lineal inch, and shall not vary more than 5 per cent from the following:—

Screen mesh per lineal inch.	Percentage by weight retained.
8	10
30	20
50	27
80	20
100	15
200	7
	1
	100 pass.

Cushion Sand.—3-6.—Cushion sand shall be clean and sharp, and not more than 10 per cent by weight shall be retained on an 8-mesh sieve. It shall not contain more than 10 per cent by weight of clay or loam.

Grout Sand.—3-7.—Grout sand shall be clean, sharp and well graded. Not more than 8 per cent by weight shall be retained on a 20-mesh sieve, and not more than 30 per cent on a 100-mesh sieve. It shall not contain more than 5 per cent of clay or loam.

Mortar made in the proportion of 1 part of cement to 3 parts of sand by weight shall show a tensile strength at least equal to 40 per cent of a similar mortar made of standard Ottawa sand, mixed in the same proportions and stored and tested in the same manner.

ASPHALTIC ROAD OILS.

General.—Asphaltic oils shall be classed into three grades, each containing the minimum percentage by weight of asphalt, of 50 deg. penetration, as follows:—

Light oil shall not contain less than 40 per centum asphalt.

Medium oil shall not contain less than 60 per centum asphalt.

Heavy oil shall not contain less than 80 per centum asphalt.

All oil, in addition to meeting the requirements of one of the above grades, shall have the following characteristics as determined in the laboratory. All tests shall be conducted according to the latest methods recommended by the American Society for Testing Materials.

The requirements are as follows:—

1. It shall be obtained by the refining of asphaltic or semi-asphaltic petroleum or by the combination of solid or semi-solid native asphalts with asphaltic petroleums or derivatives thereof, which melt on the application of heat.

2. The various hydrocarbons composing it shall be present in a homogeneous solution.

3. It shall be free from water and sediment.

4. It shall not contain acid nor sulphur in sufficiently large quantities to attack rubber or rubber compositions.

Light Oil.—Light oil shall have the following characteristics:—

1. It shall have a specific gravity of not less than 0·92 at 77 deg. Fahr. (25 degrees C.).

2. When evaporated in an open vessel at a temperature between 450 and 500 deg. Fahr. until the residue remaining has a penetration (5 seconds, 77 deg. Fahr., No. 2 needle, 100 grams) of 50 degs., the residue shall meet the following requirements:—

(a) It shall amount to not less than 40 per centum and not more than 50 per centum of the original oil by weight.

(b) It shall have a ductility at 77 deg. Fahr. of not less than 25 centimetres (Dow mould).

(c) It shall have a melting point of not more than 160 deg. Fahr. and not less than 130 deg. Fahr. when tested by the ball and ring method.

3. Fifty grams of the oil upon being maintained at a temperature of 325 deg. Fahr. for five hours in a cylindrical vessel 2½ in. in diameter and 1½ in. deep

shall not lose more than 25 per centum nor less than 10 per centum by weight.

4. It shall be soluble at air temperature in pure carbon bisulphide to the extent of not less than 99·0 per centum.

5. It shall be soluble at air temperature in 76 deg. Beaume paraffin petroleum naphtha distilling between 140 and 190 deg. Fahr. to the extent of not less than 80 per centum and not more than 95 per centum.

6. It shall yield not more than 8 per centum by weight of fixed carbon on ignition.

7. It shall show a flash point of not less than 120 deg. Fahr. when tested in an open cup.

8. It shall not contain more than 5 per centum by weight of paraffin scale.

MEDIUM OIL.—Medium oil shall have the following characteristics:—

1. It shall have a specific gravity of not less than 0·94 at 77 deg. Fahr.

2. When evaporated in an open vessel at a temperature between 450 and 500 deg. Fahr. until the residue has a penetration (5 sec., 77 deg. Fahr., No. 2 needle, 100 grams) of 30 deg., the residue shall meet the following requirements:—

(*a*) It shall amount to not less than 60 per centum and not more than 70 per centum by weight of the original oil.

(*b*) It shall have a ductility at 77 deg. Fahr. of not less than 25 centimetres (Dow mould).

(*c*) It shall have a melting point of not more than 190 and not less than 130 deg. Fahr., when tested by the ball and ring method.

3. Fifty grams of the oil upon being maintained at a temperature of 325 deg. Fahr. for five hours in a cylindrical dish 2¼ in. in diameter and 1½ in. deep, shall not lose more than 12 per centum nor less than 7 per centum by weight.

4. It shall be soluble at air temperature in pure carbon bisulphide to the extent of not less than 99·0 per centum by weight.

5. (*a*) It shall be soluble at air temperature in 76 deg. Beaume paraffin petroleum naphtha to the extent of not less than 83 per centum and not more than 90 per centum.

(*b*) When 20 c.c.'s of naphtha solution, obtained by treating 1 gram of oil with 100 c.c.'s of 76 deg. Beaume petroleum paraffin naphtha at air temperature, is evaporated upon a glass plate, the residue shall be adhesive and sticky, but not oily.

6. It shall yield between 8 per centum and 12 per centum by weight of fixed carbon on ignition.

7. It shall show a flash point of not less than 150 deg. Fahr. when tested in an open cup.

8. It shall not contain more than 5 per centum by weight of paraffin scale.

HEAVY OIL.—Heavy oil shall have the following characteristics:—

1. It shall have a specific gravity of not less than 0·96 at 77 deg. Fahr. (25 deg. cent.).

2. When evaporated in an open vessel at a temperature between 450 and 500 deg. Fahr. until the residue has a penetration (5 seconds, 77 deg. Fahr., No. 2 needle, 100 grams) of 50 deg. the residue shall have the following requirements:—

(*a*) It shall amount to not less than 80 per centum by weight of the original oil.

(*b*) It shall have a ductility of 77 deg. Fahr. of not less than 40 centimetres.

(*c*) It shall have a melting point of not more than 160 and not less than 130 deg. Fahr. when tested by the ball and ring method.

3. Fifty grams of the oil upon being maintained at a uniform temperature of 325 deg. Fahr. for five hours in a cylindrical vessel 2¼ in. in diameter by 1½ in. deep, shall lose not more than 5 per centum by weight.

4. It shall be soluble at air temperature in pure carbon bisulphide to the extent of not less than 99·0 per centum by weight.

5. (*a*) It shall be soluble at air temperature in 76 deg. Beaume paraffin petroleum naphtha to the extent of not less than 75 per centum and not more than 90 per centum by weight.

(*b*) When 20 c.c.'s of naphtha solution, obtained by treating 1 gram of oil with 100 c.c.'s of 76 deg. Beaume petroleum paraffin naphtha at air temperature is evaporated upon a glass plate, the residue shall be adhesive and sticky, but not oily.

6. It shall yield between 8 per centum and 14 per centum by weight of fixed carbon on ignition.

7. It shall have a flash point of not less than 290 degs. Fahr. when tested in an open cup.

8. It shall not contain more than 5 per centum by weight of paraffin scale.

LONDON COUNTY COUNCIL TRAMWAYS.

SCHEME OF REORGANISATION.

Proposals for the reorganisation of the London County Council tramways system were submitted at Tuesday's meeting of that authority by the Highways Committee, and adopted.

The growth in working costs and the increasing complexity of passenger traffic operation in London would alone, it was stated, justify a review of the organisation of the department, and compel attention to the necessity for a most careful scrutiny of every part of the departmental machinery. The present organisation, it was added, had resulted largely from the natural growth of the undertaking, which from time to time absorbed the staffs of purchased companies' undertakings, and subsequently expanded with the development of the system. The following figures, from the accounts of the first complete year (to March 31, 1900), after the council commenced the working of the tramways, compared with similar information for the year ended March 31, 1914:—

	1900.	1914.
Miles of track open	21·375	144·85
Car miles run	10,208,161	59,209,289
Passengers carried	117,992,713	522,952,640
Total revenue	£170,098	£2,268,668
Total number of employees	2,750	12,232

During the same period the capital expenditure on the undertaking increased from £1,710,056 to £13,028,120.

Owing to departmental conditions the chief officer had, the report stated, hitherto been compelled to devote much time and attention to ordinary executive business, while the division of the department into ten sections had also rendered necessary great efforts in co-ordination. For these reasons he had been hampered in dealing with such important matters as the development and improvement of the system, and the consideration of larger questions of tramway working and policy. The committee were satisfied that the remedy lay in devolution, and they recommended, *inter alia*: That the tramways department be reorganised on the basis of the allocation of the work of the department among five branches—viz.: (1) Traffic branch; (2) electrical branch; (3) rolling-stock branch; (4) permanent-way branch; (5) general branch, and the devolution by the chief officer of tramways of duties and responsibilities to the higher subordinate officers upon general lines. That a traffic manager be appointed; and that the salary assigned to the position be from £1,200 by annual increments of £50 to £1,500 a year. That an electrical engineer be appointed; and that the salary assigned to the position be from £1,200 by annual increments of £50 to £1,500 a year. That a rolling-stock engineer be appointed, and the salary assigned to the position be from £1,000 by annual increments of £50 to £1,200 a year, and that the position be not filled at present. That in the ultimate organisation the salary assigned to the position of permanent-way engineer in the tramways department be from £800 by annual increments of £50 to £1,000 a year. The committee also recommended that positions as follows be established in the traffic branch, at the yearly salaries specified; Development superintendent (from £500 by four annual increments of £25 and four of £50 to £800 a year); publicity assistant (from £300 by annual increments of £25 to £400 a year); an officer in charge of matters relating to fares and independent traffic check (designation to be determined) (from £200 by annual increments of £25 to £400 a year); time-tables assistant (from £250 by annual increments of £12 10s. to £300 a year). That an operation superintendent (from £500 by four annual increments of £25 and two of £50 to £700 a year) be appointed in the traffic branch. That the designation of the two district traffic superintendents be altered to divisional superintendents; and that the salary assigned to each position in the ultimate organisation be from £300 by annual increments of £25 to £400 a year.

For the post of traffic manager the appointment of Mr. J. K. Bruce, the deputy chief officer, was suggested. Upon his transfer the position of deputy chief officer of tramways would be abolished.

Institution of Municipal and County Engineers.

SOUTH-EASTERN DISTRICT MEETING AT WESTMINSTER.

Mr. H. T. Chapman, district chairman, presided on Friday last at a meeting of members of the South-Eastern District of the Institution of Municipal and County Engineers, held at the institution offices, the attendance including Messrs. E. Annett (Gillingham), W. L. Bradley (Tonbridge), A. Dryland (Surrey), W. H. Grieves (Sutton, Surrey), J. L. Redfern (Gillingham), hon. district secretary, and F. J. Wood (East Sussex).

DISTRICT OFFICERS.

In the course of the proceedings Mr. A. Dryland (Surrey) was nominated for re-election as district representative, Mr. H. T. Chapman (Kent) as district chairman, and Mr. J. L. Redfern (Gillingham) as hon. district secretary.

The re-nomination of the following as members of the executive committee was also agreed to: Kent—Messrs. W. L. Bradley (Tonbridge), H. W. Longdin (Penge), F. Harris (Tonbridge Rural), and A. E. Nichols (Folkestone). Surrey—Messrs. J. H. Brierley (Richmond), W. H. Grieves (Sutton), R. Chart, junr. (Coulsdon), and F. Grove (Surrey). Sussex—Messrs. A. E. Prescott (Eastbourne), H. W. Bowen (West Sussex), F. J. Wood (East Sussex), and O. A. Bridges (Bognor).

A SPRING MEETING.

The district secretary reported that efforts had been made to arrange for a meeting of the district at Maidstone. It had been necessary, however, to abandon the idea of this gathering for the present, but he was hopeful that it would be possible to hold a meeting in a district nearer London, probably in April next.

ELECTION OF ASSOCIATE MEMBERS ON THE COUNCIL.

Mr. Grieves recalled the fact that at the annual meeting of the institution at Blackpool last June it was unanimously decided, on his proposition, to recommend the council to take into consideration the question of amending the by-law which limited the choice of members in the above matter by compelling them to vote for two associate members. Greatly to his surprise, the council, at their meeting in October, passed a resolution in the following terms: "That after years of consideration it is the opinion of the council that the method adopted is the best for securing the representation of the associate members on the council, and that therefore no action be taken." Mr. Grieves complained that he had had no intimation of any sort as to the decision of the council, and he considered that the treatment which had been accorded him could scarcely be described as fair, having regard to the Blackpool resolutions. Neither was it fair that they should be compelled to vote for two associate members whom they probably knew nothing about. His view was that election should be open as for other members of the council, and he moved that the council be asked to receive a deputation from the district on the matter.

The motion was agreed to, and Messrs. Chapman, Redfern, Dryland, and Grieves were appointed to form the deputation.

THE ORPHAN FUND.

The hon. district secretary reported the receipt of the following communication, dated November 11th last, from Mr. O. Claude Robson, hon. secretary and hon. treasurer of the institution's Orphan Fund:—

DEAR MR. REDFERN,—At a meeting of the Orphan Fund Committee on the 3rd inst., consideration was given to the question of enlisting closer co-operation with the various districts which it was thought would tend to augment the income of the Orphan Fund of the institution, which at the present time numbers but 217 subscribers from a total of 1,797 members, forming the muster roll of the institution. You will perhaps remember that the subject was broached by Mr. Massie at the annual meeting at Blackpool, when it was felt that some strenuous effort should be made to render the fund more worthy of the association by endeavouring to secure the sympathy and assistance of the various districts by utilising the machinery of the district committee for the purpose of increasing the number of subscribers to the fund. At the meeting of the Orphan Fund Committee before mentioned the matter was earnestly considered, and the following resolution was carried, viz.:—

"That one or more Orphan Fund stewards be appointed in each district to advocate the claims of the fund, to promulgate its work, to solicit and collect subscriptions and donations, to investigate cases needing assistance, and to report to the secretary on all questions relating to the work of the fund.

In the hope that some practical result may accrue from the foregoing resolution I was instructed to communicate with the secretaries and representatives of the various districts to nominate one or more members who would be willing to take in hand the office of steward as suggested in their respective districts, and thereby enable the committee to cope more generously with the distressful cases already being dealt with, and likewise afford sufficient funds for future cases which are most likely to occur these strenuous times. It is intended that the stewards should be "ex-officio" members of the committee of the fund, where their special knowledge of their particular districts would greatly assist in dealing with cases that come within their knowledge.

I should, therefore, be greatly favoured if you would kindly give the resolution your earnest consideration, and let me know at as early a date as possible as to the name or names of the members that are willing to act as stewards, in order that I may present the result of this appeal to the next meeting of the committee in December. I am also writing the chairman and representative of the district, with whom you will probably confer upon the matter.

Personally, I have endeavoured upon more than one occasion, by appeal to all members of the institution, to secure additional interest and assistance for the fund, but I feel sure if these appeals are made by one especially associated both professionally and socially with neighbouring members, that a better result may ensue.

I must apologise for the length of this communication, but sincerely hope that it may result in an initiative towards a brisker life for the Orphan Fund and corresponding advantage to the little ones of our friends who have been called away.

Faithfully yours,

O. CLAUDE ROBSON,

Hon. Secretary and Hon. Treasurer.

The CHAIRMAN said he thought those present would agree as to the urgency and necessity of augmenting the fund in view of the heavy demands which were certain to be made on it as a result of the war. One means of effecting the desired end would be to allocate to the fund a portion of the subscriptions of the whole body of members.

Mr. DRYLAND: Would the finances stand it?

Mr. REDFERN: Yes; it would be interesting to know whether there is any surplus on the present subscriptions. There is no doubt a good many subscriptions have been lost owing to the war.

The CHAIRMAN: Of course, whatever was allocated from the funds of the institution would not wholly meet the necessities of the case.

Mr. REDFERN: Does the institution itself contribute anything to the fund?

Mr. DRYLAND: I do not think it does.

Mr. REDFERN: Well, I think it ought to.

Mr. DRYLAND: The answer, I suppose, would be that the funds would not permit it.

The CHAIRMAN said there was no doubt Mr. Robson was an excellent secretary and treasurer, but it was obviously impossible for him to get into personal touch with all the members of the institution, and if arrangements could be made by which someone in each county could make appeals on behalf of the fund it would be more effectual than the present system.

It was agreed to appoint representatives in the several counties comprising the district, to act in the capacity of stewards, and it was further resolved that as the county surveyors had frequent opportunities of meeting the members, they should be asked to undertake the work in their respective areas.

STUDS ON AGRICULTURAL LOCOMOTIVE WHEELS.

The order, issued recently as a temporary war measure, making it permissible for the wheels of agricultural locomotives to be fitted with studs for use on frostbound roads, was referred to by Mr. Grieves, who stated that his council had on the previous night decided to forward a protest to the Local Government Board against the order. The effect of these studs was, he observed, particularly destructive on roads just getting free of frost.

Mr. CHAPMAN remarked that he had been asked for advice by several districts in Kent; but they had to remember the country was at war, and it was important that these vehicles should not be prevented from working.

It was pointed out that the damage would have been done before any effective steps could be taken to prevent it. What was of the greatest importance, however, was to see that the order was not allowed to continue in operation after the war.

After further discussion it was decided to ask the council to urge upon the authorities the desirability

of consulting the institution before such orders were issued.

A SANDGATE APPOINTMENT.

The Chairman drew attention to a recent advertisement of the Sandgate Urban District Council inviting applications for the temporary office of surveyor, water engineer, inspector of nuisances, &c., at a salary of £200.

Mr. Chapman stated that a letter had been sent by the Institution pointing out the inadequacy of the salary offered, and suggesting that the remuneration should be increased to £250 per annum.

Mr. Redfern observed that the institution ought to give their members hint not to apply for such positions.

Following further discussion, it was moved that it should be part of the duties of the council to deal with such matters in the interests of the members.

The resolution was agreed to, and the meeting shortly afterwards terminated.

NEWPORT (MON.) WATER SUPPLY.

THE CAERFANELL SCHEME.

In view of the probable development of Newport after the war, the corporation of the *South Wales Daily News* states, is making inquiries for a further water supply. Already they have provision for 675,000,000 gallons in their present reservoirs, but, according to a report submitted by Mr. J. F. Jupp, M.Inst.C.E., and Mr. H. Tremelling, the borough engineer, there will be a deficiency of 10,000 gallons per day in 1925. This will go on increasing, and in 1930 they estimate a daily deficiency of 1,359,478 gallons. The Henllys Reservoir scheme would only provide 1,000,000 gallons per day. They add that there is no site in Monmouthshire capable of yielding any large quantity of water by gravitation to Newport. They had inspected several sites on the borders of Breconshire—Cwmdu, near Talgarth; the Grwyne Fechan, in the Black Mountains; the Honddu, above Llanthony; and the Caerfanell, above Talybont. The latter had many advantages over the other sites for a large reservoir, and they considered it was the most suitable area they had seen to augment the supply.

THE SITE RECOMMENDED.

The Caerfanell was a tributary of the Usk, and the valley adjoined those of the Taff Vawr and Taff Vechan, which supplied Cardiff and Merthyr. There was an excellent site for a reservoir at Pont Rhydybine, 2¼ miles from Talybont. The reservoir would be 1¼ miles long, with 220 acres water area, with a capacity of over 2,000,000,000 gallons. The waters were part of those proposed to be utilised in the Welsh water scheme for London some years ago. The drainage area of 5,510 acres would yield 7,000,000 gallons per day. Mr. G. R. Thompson, the analyst, had reported it to be an excellent water for domestic supply. The distance of the site from Newport was 32 miles. The pipe line would proceed down the valley to Talybont, thence on the west side of the Usk past Llangynidr, Llangattock, Gilwern, Llanfoist, Llanover, Pontypool Road, Llantarnam, and Malpas, when they would connect with the present mains. Other than for one mile the whole of the 32 miles of pipe line would be in public roads, thus avoiding cost of easements.

ESTIMATED COST.

The following was an estimate of the cost of the works based on the 1916 prices:—

Reservoir at Caerfanell Valley	£200,000
Measurement Sluices	6,000
32 miles of pipe to Newport	151,000
Purchase of land and easements	30,000
Intervening reservoir at Malpas	1,000
Contingencies 15 per cent.	38,000
	£422,000

At the request of Alderman T. Parry, chairman of the Corporation Waterworks Committee, the borough engineer is to prepare a report on the cost to the rates if the scheme is adopted.

Change of Address.—Messrs. Siemens Brothers and Co., Limited, and Siemens Brothers Dynamo Works, Limited, have removed from Caxton House, Westminster, to Palace-plain-mansions, Kensington-court, London, W.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it a fact, as recently stated in an Irish paper, that a scheme for allotments which had been formulated by the Birr, Ireland, Urban District Council has been "killed" by the action of the Local Government Board of Ireland, who decline to allow to be taken by one tenant any allotment of an area exceeding one-eighth of an acre, whereas agreements had been entered into with several tenants to cultivate two or even three acres, at rentals that would cover all expenses? Does it not seem to be a curious anomaly—if the facts are correct—that, whereas, on the one hand, the Government are crying out for more land to be put under cultivation, the hide-bound, red-tape rules of a Government Department should seek to nullify this most desirable and essential movement?

* * * *

Is it not "a feather in the cap" of ferro-concrete construction when in a description in the February issue of *Fire* of the damage caused by the recent great explosion in the East of London it is stated that "not only have such structures withstood the effect of the air-wave, but they came through the ordeal of fire successfully"? The description also refers to the partial elasticity of such structures, which were able to "give" slightly to the shock, whereas "brick structures collapsed ignominiously, being pulled inward by the floor and roof joists and girders." When we know also that a reinforced-concrete roof is the best protection from a falling bomb, is it not evident that this form of construction has many merits over ordinary construction?

* * * *

Is it not fairly evident that one of the results of this terrible war will be to impress the people of this country, and perhaps those of other countries, that the man of the future will be the one who can do things, and not the orator—or political spouter? Will not science and practical knowledge take the place of so-called oratory, and the engineer be reckoned of more value than the politician, the lawyer, or the agitator? Is it not about time that those who make for the progress of the world should be properly recognised?

* * * *

Should not the war also be the means of furnishing names for new streets and roads, and is there not a good deal to be said in favour of the critics of a committee at Dudley for their want of originality in regard to street nomenclature in recommending that several new roads in a recently developed building estate should be named after local public men, "including several members of the committee," whereas the critics justly suggest that the streets should be named after our Army generals or places where our gallant fighters have achieved renown?

* * * *

Has the question ever been seriously considered in this country as to the time which should be taken in mixing a batch of concrete in order to produce the best result? In this connection is it not interesting to see that the chief engineer of the Pennsylvania State Highway Department has been recently carrying out some experiments in this direction with the following results:—

Time of mixing.	Number of revolutions of mixing machine.	Compressive strength of concrete. lb. per sq. in.
¼ minute	9	1,400
1 ,,	17	1,587
1½ minutes	20	1,926
2 ,,	36	1,661
3 ,,	51	1,673

The concrete blocks were all based on an age of eight days. Is it not evident from the excellent result obtained with the 1½-minute mixing test that this period seems to be about the right time to give?

* * * *

Is there any practical remedy for the enormous waste of water which occurs during periods of frost owing to the practice of consumers letting all their taps run so as to prevent the water freezing in the pipes? But if the pipes were allowed to freeze and burst, would there not be an enormous waste of water when the thaw occurred, and would it not be better if powers under an Act could be sought whereby the "undertakers" could refuse to supply water to any premises unless all the pipes were sufficiently protected by lagging or otherwise against the action of frost?

Highways and Byways.*

By LAWRENCE W. CHUBB, Secretary to the Commons and Footpaths Preservation Society.

The story of the King's highway has the rare merit of being able to arouse the interest and quicken the imagination of all sections of the community. It appeals to the historian and to the student of sociology, because each great era of road construction or improvement in this country has synchronised with vital changes in the social life and environment of the people, and in the economic development of the land. It was, for instance, due to the vast network of roads constructed during the period of Roman occupation that Britain was finally subjugated and the door was opened to the forces of civilisation as well as to the effective use of military power. Again, the coming of the Turnpike Trusts and "Macadam the Magician" contributed largely to the enormous expansion in industry and commerce which took place in the Georgian period. It will be the task of the future historian to appraise the services rendered by highways in these days when the fate of nations is in the melting-pot. In the meantime none will deny that problems of vital importance in connection with the rapid transit of troops and supplies have only been rendered possible of solution by practical experience gained on highways in connection with the development of the motor car.

The romantic and picturesque incidents associated with ancient and modern methods of travelling have, since the time of Chaucer, exercised a striking influence upon literature, and the subject of highways has, for mundane and other reasons, a great attraction for the lawyer and engineer. It makes its strongest appeal, however, to the imagination of the man in the street, for the word "highway" symbolises public rights and freedom—

"Fair and free, night and day,
Fair and free is the King's highway."

It is to this aspect of the subject that I desire mainly to draw attention, because, while every individual is personally concerned in the preservation of highways, few realise the limitations of public rights and the difficulty of maintaining them, or appreciate the ceaseless and bitter struggle which the Commons and Footpaths Preservation Society has found it necessary to wage on their behalf in order that those rights may be maintained.

A public highway may be defined as a strip of land over which every subject of the King is lawfully entitled to pass. The extent of his rights is another matter. If he is merely entitled to passage on foot, the way is a highway for foot-passengers only; if he is entitled to ride a horse over a track, the way is a bridle-path or horseway, and a footpath as well. If carriages may lawfully be driven by the public over the way, it is a carriage road and also a bridle-path and footpath.

EXTENT OF PUBLIC RIGHT.

The public right is confined to an easement of passage; it does not embrace the ownership of the soil, which, in most instances, remains vested in the adjoining owner or owners by whom, in normal cases, is owned the freehold to the centre of the metalled portion of the carriageway. That is why the timber growing on the open wastes at the sides of roads belongs to the adjoining owners. So jealously do the Courts preserve the landowner's interests that it has been held that a man is not entitled to walk backwards and forwards along a public path over a Yorkshire moor in such a way as to intertere with a grouse drive (*Harrison* v. *Duke of Rutland* (1893), 1 Q.B., 142). In delivering judgment in this case, Lord Justice Lopes enunciated the legal principle involved. He said: "If a person uses the soil of the highway for any purposes other than that in respect of which the dedication was made and the easement acquired, he is a trespasser. The easement acquired by the public is a right to pass and repass at their pleasure for the purpose of legitimate travel, and the use of the soil for any other purpose, whether lawful or unlawful, is an infringement of the rights of the owner of the soil, who has, subject to this easement, precisely the same estate in the soil as he had previously to any easement being acquired by the public." In another case (*Hickman* v. *Maisey* (1900), 1 Q.B., 752) the defendant was held to be a trespasser because he walked backwards and forwards along a public carriage road in order to observe the form of horses under training on adjacent downland. In this case, however, Lord Justice Smith held out a crumb of comfort to the weary wayfarer, for he said: "If a man while using a highway for passage sat down for a time to rest himself by the side of the road, to call that a trespass would be unreasonable. Similarly, if a man took a sketch from the highway I should say that no reasonable person would treat that as an act of trespass." In another dispute (*Fielden* v. *Cox* (1906), 22 T.L.R., 411) the Court declined to grant an injunction to restrain persons from trespassing on a highway by using it for the purpose of catching moths by means of lamps and other appliances, on the ground that the trespasses were merely technical.

Nevertheless, the strict legal view is that a pedestrian is not entitled to a general right to stray over land not dedicated to the public use and enjoyment, although that land is unenclosed common or open down, and so accustomed are we to speak with pride of an Englishman's rights that it comes almost as a shock when we first realise that his most comprehensive right—a right of way—is confined within exceedingly narrow limits, and that it is possible that a man may be a trespasser upon a public highway.

DEDICATION.

Having thus considered the nature of a public highway, it becomes necessary to make some inquiry into the origin and history of such ways. Theoretically every highway must have originated either by the operation of an Act of Parliament or by dedication—express or presumed—by some owner of the land over which it passes. Although, as we shall see, a number of carriage roads and fewer footpaths have been created by statutory authority, the vast majority are deemed to have come into existence by means of dedication. "Dedication" is the expression used to describe a convenient legal fiction devised to account for the existence of a public interest in highways. The word connotes the grant to the public, by some past or present freeholder of a perpetual right of passage over his land. On rare occasions dedication may be proved by the production of an actual grant, or it may be implied by special acts clearly indicating the intention of the owner to give to the public an inalienable right of passage. This form of dedication is known as "express" dedication, but it is not often possible to establish it. All that can be proved in normal cases is that, throughout living memory, a path or road has been publicly used as a thoroughfare, freely, openly, and without interruption. Where this is possible it is presumed that dedication has taken place, although no actual grant can be produced.

It is obvious that the percentage of rights of way which have been dedicated in a literal sense must be infinitesimal, for few owners would be inclined voluntarily to burden their property with an easement which, once existing, could only be lawfully extinguished by Act of Parliament, or by an elaborate and expensive process involving a Justices' Certificate and the consent of Quarter Sessions, or by the utter destruction of the way through some act of God.

When it is remembered that the antiquity of highways in general cannot be gainsaid, the doctrine of presumed dedication, and all that it involves, appears to the lay mind to be not far removed from the ridiculous. Some deeply-scored by-roads in use to-day probably existed as footpaths and pack-ways in the time of the early Britons for the conveyance of tin and furs in pre-Roman days. Yet each of them is deemed to have originated in dedication.

ORIGIN AND DEVELOPMENT OF OUR HIGHWAY SYSTEM.

Before asking you to consider the difficulties which the public encounter in maintaining their rights-of-way in consequence of the far-reaching effect of the theory of dedication and all that it implies, it may be convenient that I should outline the origin and development of our highway system, and the manner in which ways have been created by Act of Parlia-

*Paper read before the Royal Society of Arts on the 14th inst.

[illegible]. We owe the foundation of that system to the Romans. Those wonderful road-makers were worried by no [illegible] to deforestation or the sacred rights of property, but drove their ways over hill and dale, through marshes and dense woodlands, with a relentless purpose and patient industry which we can only admire with amazement.

The main Roman roads certainly extended for an aggregate distance of 2,500 miles, and some scholars of repute believe that their total length in Britain [illegible], with their connections, to over 4,566 miles. When it is remembered that the flint, gravel, and other material required for the high causeways in which the roads were formed sometimes had to be carried for great distances, it is possible to realise something of the marvellous achievement of the Romans.

The construction of important trunk roads must have led to the opening of many cross tracks, but there is no evidence of efforts to maintain any of the Roman roads after the departure of the legions. They endured in spite of neglect, because they were well built. Indeed, the four great routes, Watling-street, the Icknield Way, the Foss Way and Ermin-street came to be regarded as of value for a reason quite unconnected with traffic. They gave the King's peace or sanctuary to any man who fled to [illegible] success. While on them he was safe from pursuit or molestation.

With the imposition of the rule of the Norman and the organisation of the manor as a unit of local government, the maintenance of the King's highway was imposed as a theoretical duty upon the lord of the manor and his tenants subject to the adjustment and control of the Court Leet. Wheeled traffic was almost unknown, save for the rough carts [illegible] to carry home the crops, and the customary highways were for centuries almost exclusively traversed by pedestrians and horsemen. Until the dawn of the nineteenth century the principal part of the [illegible] in remote districts was conveyed to market by packhorses, although in some places common carriers were prepared even in the fourteenth century to convey grain by cart at the rate of one penny per ton per mile.

First Highway Acts.

The Statute of Winchester, passed in 1285, was the first Act of Parliament which purported to deal with roads. It did not go far, for it merely ordered that "highways leading from one market town to another shall be enlarged where as bushes, woods, or dykes be, so that there be neither dyke nor bush whereby a man may lurk to do hurt within 200 ft. of the one side and 200 ft. of the other side of the way." No attempt at actual maintenance of the surface of the highway was made, or was considered necessary, until the growth of vehicular traffic rendered repair an imperative necessity. If the way became foundrous or impassable, the traveller might deviate upon the adjoining land, even if cultivated, for the judges decided that it was "the good passage" that constituted the highway and not merely "the beaten track." Where the land on either side of a public way remains unenclosed this rule still obtains, and [illegible] are entitled to separate the highway from [illegible] and the burden of repair, *prima facie*, [illegible] on the adjoining occupier, as long as his [illegible] debar the public from their common law [illegible].

It is not until [illegible] another Highways Act [illegible] Mending of Highways Act, 2 & 3, Philip & Mary (1555), and this once and for all cast upon the inhabitants the obligation to maintain the highways in their parishes. Surveyors of highways were ordained to be appointed by the parishioners and were authorised and required to direct the performance of statute labour upon the roads. This was a form of "[illegible]" which no man might lawfully evade, but which imposed a burden from which all [illegible] themselves. Roads became more neglected than ever, and were more polluted by large droves of cattle, sheep and pigs [illegible] usually tramped their way along the [illegible] from Norfolk to the markets of London. Many new highways, too, came into existence with the passage [illegible] Acts authorising the inclosure of commons. The general result of the Acts [illegible] the setting out of [illegible] and the question of repair remained unsolved. Turnpike trusts were therefore destined to remedy the deplorable state of neglect into which the King's highways had fallen. Certain individuals, with a view to the repair of particular roads, subscribed among themselves for that purpose, and erected gates upon the roads, taking tolls from those who passed through them.

The Turnpike Trusts.

The first scheme of this kind received the consent of Parliament in 1663, and dealt with ways in Herts, Cambs, and Hunts. It was not, however, until 1706 that the first Turnpike Act proper was passed. This proved so successful that, altogether, over 1,100 turnpike trusts were created in England and Wales, having under their control 23,000 miles of road and enjoying and spending a gross annual revenue of £1,500,000. Each trust was empowered to construct and maintain a specified piece of road and to levy tolls for a limited period of years, usually twenty-one. The powers were renewed from time to time, and Parliament further permitted the Surveyor of Turnpike Trusts to require the performance on the roads under his charge of the unpopular and personal obligation of Statute Duty and Team Labour first sanctioned in 1555.

(To be continued.)

MOTOR MACHINE BROOMS AT SHOREDITCH.

RESULTS OF TWELVE MONTHS' WORKING.

In a report to his Highways Committee on the working of two "Laffly" motor machine brooms at Shoreditch during the past twelve months, Mr. C. T. Fulcher, the acting borough surveyor, directs attention to the excellent financial results obtained and to the efficiency achieved by their use.

The particulars are briefly as follows, while the details are as per statements attached:

Machine No. 1 commenced work on January 24, 1916.

Machine No. 2 commenced work on April 15, 1916.

Actual car mileage 31,339 miles, as against 23,920 miles worked by old horse machines, or 31 per cent more than was ever scavenged by the old horse machines, and therefore 31 per cent more than estimated for.

Actual cost of running, including depreciation, £838 5s. 2d., to which should be added £100 for tyre renewals and overhauling, due shortly, making a total of £938 5s. 2d., as against an estimated expenditure of £1,114 15s., thereby showing a saving against the estimate of £176 9s. 10d.

In addition, their use has caused very considerable saving in other sections of the scavenging department, which has resulted in a total saving of £1,444 14s. 10d. on the expenditure which would have been incurred if the use of horse machines had been continued.

This is to be understood more exactly by the following:

	£	s.	d.
Estimated cost of horse machines on the old scale of operations, for the period during which the motors have been employed, as per Statement No. 2	1,148	4	0
Actual saving on previous method with horse machines on night scavenging, as per Statement No. 3	537	0	0
Actual saving on day orderly work, as per Statement No. 4	357	16	0
Actual saving by non-purchase of horses, taken at 3 horses only, at £80 each	240	0	0
	£2,283	0	0
Loss—Motor machine costs as per Statement No. 1	838	5	2
Net saving	£1,444	14	10

Against this saving an allowance of £100, beforementioned, for overhauling, &c., should be made.

"Also it should be remembered," says Mr. Fulcher, "that, over and above this saving, I consider the value of their assistance in the several falls of snow which have occurred resulted in a saving of at least £350, so that it may be taken that their adoption has resulted in a gross saving of £1,795 on the expenses which would have been incurred by the continued use of the horse machines.

"Regarding the actual machines themselves, they have more than fulfilled the expectations I had concerning them, and it is a matter for congratulation that no mechanical troubles have occurred, with the slight exception that for two nights, and that on one machine only, has either machine been out of service. The tooth in the driving gear which broke

off and occasioned this stoppage was speedily put right, and the machines are running as well as—in fact, really better than—when they were first purchased.

"The small quantity of petrol consumed, and the high mileage per gallon—*i.e.*, 14 miles per gallon—is in itself remarkable, and is largely accounted for by the fact that the majority of the work is performed at night, when the streets are free from traffic, and the machines obtain long, uninterrupted runs."

In Mr. Fulcher's opinion the results obtained thoroughly justify the optimism with which the committee sent their report on his proposal to the council; and, in conclusion, he expresses his appreciation of the enthusiasm and ungrudging manner in which the men, and in particular Mr. Eastop, the wharf inspector, have worked to ensure the machines proving a success.

(1) RUNNING COSTS, 24TH JANUARY, 1916, TO 20TH JANUARY, 1917.

	£ s. d.	£ s. d.
Drivers' wages		262 2 0
83 sets broom refills... ...		195 12 1
2,238½ gallons petrol ..	169 10 11	
17 gallons paraffin	19 10	
		170 10 9
78½ gallons lubricating oil ...	10 19 0	
2 cwt. grease	4 13 11	
		15 12 11
Insurance	13 10 0	
Licences	2 0 0	
Miscellaneous...	4 11 10	
		20 1 0
		£663 18 9
Depreciation of machines, 12½ per cent on £1,338 11s. 6d.	167 6 5	
Depreciation on machine stocks, 20 per cent on £35	7 0 0	
		174 6 5
		£838 5 2

Actual mileage	31,339·	
Actual number of working hours... ...	3,966·	
Average life of broom refills	47·75	hours
Cost per car mile	6·419	pence
Cost per mile of thoroughfare	38·517	pence
Cost per working hour	50·726	pence

(2) ESTIMATED COST OF RUNNING HORSE BROOMS DURING SAME PERIOD.

	£ s. d.
Wages of drivers	475 4 0
Keep of horses (including veterinary attendance and shoeing)	288 0 0
Repairs and depreciation, harness... ...	12 0 0
" " " machines ...	70 0 0
Depreciation of horses	110 0 0
Broom refills	183 0 0
Men's clothing	7 0 0
Lubricating and lamp oils	3 0 0
	£1,148 4 0
Approximate mileage...	23,920 miles

(3) ACTUAL SAVING ON NIGHT SCAVENGING OPERATIONS.

	£ s. d.
Wages, three drivers	260 0 0
Keep, three horses at £1 per week (including veterinary attendance and shoeing)	156 0 0
Repairs and depreciation, 3 water vans at £5	15 0 0
Repairs and depreciation, 3 sets harness at £2	6 0 0
Water	100 0 0
	£537 0 0

(4) ACTUAL SAVING ON DAY ORDERLY SCAVENGING.

	£ s. d.
Wages, four sweepers	332 16 0
Brooms and squeegees	25 0 0
	£357 16 0

Municipal Bills in Parliament.—The Barrow-in-Furness Corporation Water Bill, the Blackpool Improvement Bill, and the Sheffield Corporation Bill have been read a second time in the House of Commons, and sent forward to Committees for consideration.

LOCAL AUTHORITIES AND LAND CULTIVATION.

SUPPLY OF SEED POTATOES AT SOUTHALL-NORWOOD.

Mr. Reginald Brown, M.INST.C.E., the engineer and surveyor to the Southall-Norwood Council, has tackled with characteristic energy the question of the supply of seed potatoes to the amateur cultivators in his district. On the 6th inst. Mr. Brown issued, through the medium of the local Press, the following notice:—

KIND OF SEED. The classes of seed which it is hoped to supply are: Sharpe's Express, Eclipse and British Queen, King Edward, Up-to-date, and Arran Chief. The best endeavours will be made to secure these seeds, but it must be clearly understood that it may be necessary to accept other and similar classes, as there may be a difficulty in obtaining some of those mentioned, especially Eclipse and Arran Chief.

PRICE OF SEED.—The price to be paid by the cultivators for seeds delivered—as hereafter defined—will be, approximately, as follows (all at per cwt.):—

Sharpe's Express, 16s.; British Queen, 15s.; King Edward, 15s.; Up-to-date, 15s.; Arran Chief, 16s. I have no quotation yet for Eclipse, but cultivators may have to accept British Queen instead.

ALLOCATION OF SEED.—Those cultivators who have expressed a desire for seed other than those in the above list will be allotted one of the sorts named in the list in lieu thereof.

DELIVERY OF SEED.—If possible delivery will be made to the cultivators' houses in cwt. lots, and those who have ordered quantities of less than 1 cwt. will have to make arrangements to fetch their seed; but in the latter case delivery will, it is hoped, be made as near as possible to residence of the cultivators—probably with some house in the same street. The places to which the seed will be sent will be conveyed to each cultivator on "payment" day, or by public notice.

PAYMENT FOR SEEDS. So as to save correspondence and booking, all seed must be paid for before the order is placed with the merchant. For this purpose I appoint Wednesday next, the 14th inst., as "payment" day, between the hours of 10 a.m. and 12 noon, 2 p.m. and 4 p.m., and 6 p.m. and 8 p.m. All those who have placed orders for seed potatoes will be expected to attend personally at, or send a responsible representative to, my office, and deposit the estimated cost of the seed required by them. If the actual cost is less than the amount deposited, the excess will be refunded to the payee, and if the actual cost exceeds the amounted deposited, the payee will be called upon to pay the excess.

I want it to be clearly understood that all seed must be paid for on the day named, as orders will be sent for delivery of seed on the following day (15th inst.), and unless payment is made the orders will not go forward, and cultivators will be disappointed. This arrangement is absolutely necessary under the circumstances of the case.

The success which has attended Mr. Brown's efforts is apparent from the report in last week's *Southall-Norwood Gazette* that, on the appointed day, his office was besieged by applicants for seed potatoes, the amount taken during the afternoon alone being over £200. There were still more applicants in the evening, and the town hall was continually crowded with a queue waiting to enter the office, and it was well after nine o'clock before the last applicant had been attended to. The total amount of cash taken was about £400.

Salford War Bonuses.—War bonuses amounting to £23,000 per annum have been granted to all employees of Salford Corporation whose salaries or wages do not exceed £300 a year.

Linking up of Electricity Works.—Mr. Lawrence J. Kettle, M.I.E.E., deputy city electrical engineer of Dublin, gave a lecture at the Dublin College of Science on the 16th inst. on "The City of Dublin Electricity Works," in the course of which he suggested linking up the various electricity works in the Dublin district, and supplying them, as far as possible, from one station. In addition, he said, portions of the County Dublin might be taken in, and should supply a paying load. The saving in supply costs which could be effected would probably be several thousand pounds per annum, and this should justify a considerable capital expenditure and still show a profit margin. The suggestion was, at any rate, worthy of consideration.

Fires and Wide Streets.—In a paper on "Fire Insurance in its Relation to Buildings and Architecture," which he read at a meeting of the Insurance Institute of London on Monday, Sir Aston Webb, R.A., said that wide streets were a great means of protection from the spread of fire from one building to the opposite one. The City of London was a great sinner in this respect, many of the streets not being more than 20 ft. to 25 ft. wide, which enabled the buildings opposite easily to catch alight. They certainly did not want another Great Fire of London, but were it to happen he believed that as the last Great Fire changed London buildings externally in four years from wood to brick, another would change them internally from wood to concrete

Correspondence.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ.

(One man does not see everything.) —EURIPIDES.

VENT SHAFTS ON PRIVATE HOUSE DRAINS.

To the Editor of THE SURVEYOR.

SIR,—The illustrations on p. 166 of your issue of the 9th inst. immediately arrested my attention upon opening THE SURVEYOR. They are tasteful and wonderful, but awfully pretty. The bends, elbows, square junctions, vertical drops, traps, syphons, specials, elongated sink wastes, "two-way" pieces, fresh-air inlet, double inlets, &c., are marvellous, and the whole system appears to be incapable of further mean development.

In the absence of any special mention, the fresh-air inlet appears to be unpatented, finished flush with top of pavement, and therefore capable of emitting all the foul emanations within the confines

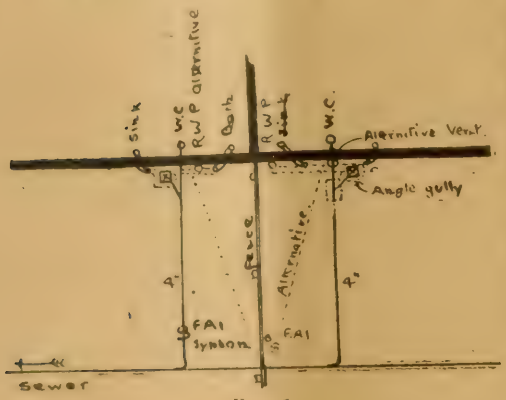

FIG. 1.

of the drains. With the exception of being able to plunge the syphons, access to any part of the drain is not available in case of obstruction without smashing this wonderful contraption. Whatever use may be made of this system in Scotland, I venture to predict that it will never be copied in England—by an expert.

It is only just that I should "stand up" to Mr. Shatto, the architects and the Dean of Guild Court.

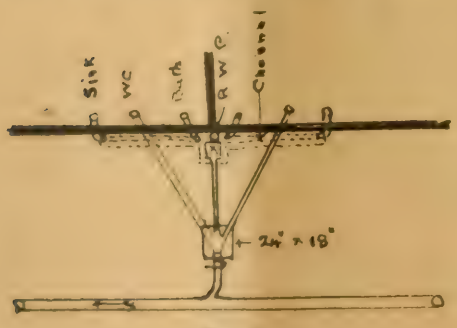

FIG. 2.

by publishing [illegible] permission alternative plans and I will take a knock-out blow with the best grace possible.

The absence of a back elevation to the house prevents one being in doubt as to the merits of the alternative suggested. A dividing fence between [illegible] would materially alter the aspects of the case. Rain-water pipes and yard gullies are abominations [illegible] to endeavour [illegible] syphonage up to "whose turn it is to clean them." [illegible] in the long run, a more way of economising [illegible] the labour.

[illegible] are decidedly the best and cheapest, although [illegible] not appear to have received [illegible] scathing scheme. Even with the [illegible] there are numerous possible variations. I would omit the yard syphon and fresh-air inlet, inserting instead a 3-in. or 4-in. cast-iron vent pipe, square off the drain up each house if windows were not in the way, thus ventilating drain and sewer. If bedroom windows were well below the level of guttering, the vent pipe, which would, of course, be properly caulked, might be used as a rain-water pipe, thus obviating duplication of stack pipe up the house. If a fresh-air inlet is imperative and a vent unnecessary, converge drains towards dividing fence (if there be one), and erect a single or joint shaft on

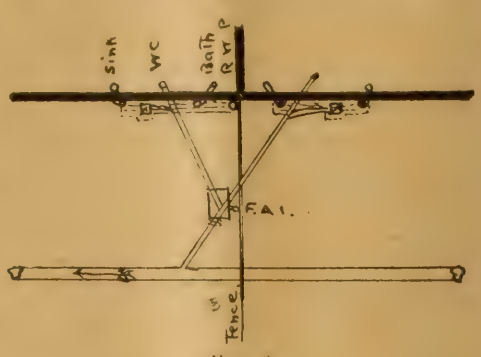

FIG. 3.

the fence, it may be 1 ft. or 6 ft. high. An extra 5os. would insert an inspection chamber 18 in. by 21 in., with rodding-arm syphon in wall, and this is a sound investment. One would naturally bring a 2-in. rain-water pipe down somewhere near the gully, unless it were imperative to bring a joint one down centre, although it would cost £1 extra. A blue brick or concrete gutter from foot of same to gully can be formed at a very slightly higher cost than plain paving. With twenty years' experience, I venture to say that a cottage sink and bath are better without traps, which are continually becoming obstructed. "Deliver the stuff on to the surface outside as soon as you can" is a sound axiom.

(2) This may be used where no dividing fence is erected, and has as many variants as No. 1.

(3) This meets the views of those who favour the drains entering the sewer with the flow, which has no particular merit in my eyes. It also has the advantage of bringing the drains from under centre of fence.—Yours, &c.,

T. H. NEGUS, M.I.M. AND CO.E.

Coleshill.
February 13, 1917.

COINAGE DECIMALISATION BILL.

To the Editor of THE SURVEYOR.

SIR,—I would invite your attention to a draft of a proposed Bill for the Decimalisation of our Coinage, published for general information in the *Times* Trade Supplement of February, 1917. The draft is, apparently, to be circulated to British Chambers of Commerce only, when, if approved, the Bill will be laid before Parliament. The question concerns other people besides members of the Chambers, and the terms of the Bill are well worth consideration. Compulsion is intended for there is a clause making it illegal to use any other than the decimal "coins of account" as such, and making void any document in which, after the proposed date of the Act (1917) any other coins are mentioned.

I may add that there is a very strong feeling among engineers and manufacturers that the Decimal Association is not "playing the game." The engineering professions and working classes are straining every nerve, and devoting all their energies mental and physical, to beating the enemy in munitions, ships, plant, &c. The decimal agitators chose the awful time when their ironcrest opponents are either nearly worked to death at home or in the trenches abroad to press the passage of an Act which the engineering classes of this country think unfair, injurious, and unnecessary. Without muni-

The Surveyor
And Municipal and County Engineer.

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tions, not human coinage, gold, nor credit are of avail. If any of the British deserve consideration, who but those men who have, for the *n*th time in our Island story, consecrated the British inch, the British pound weight, and the British penny with their blood and their sweat? Our export trade depends upon the engineer and the manufacturer, and financiers and merchants are willing enough, when it suits them to do so, to proclaim that our exports must at least balance our imports, yet the same commercial community cannot refrain from constant nagging at, and continual meddling with, the units the engineering classes find essential to their business.

The first schedule at the end of the draft Bill ought to be a revelation to most people. It is proposed to retain the sovereign and half-sovereign as they are. We are to have four-shilling and two-shilling pieces, and to abolish the crown and half-crown. The shilling is to be called a 50-cent piece, and the sixpence a 25-cent piece. So far, the coins seem merely to change their names; but, in spite of metric bounce that halves and quarters are permissible, we are to be deprived of the useful half-crown.

The penny and farthing (as we know them) are to be abolished, and in their place we are to get a British dime of 2·4d., a half-dime of 1·2d., a new penny of 0·96d., a new half-penny of 0·48d., and a British cent or new farthing of 0·24d. That is, 12½ pennies will make a shilling, an "awkward, vile, intolerable, clumsy" number; worse, if anything, than the "5½ yds. which metric advocates so much object as to making the British 5-metre rod, pole, or perch! Further, no dealer in his senses could possibly take 0·96d. for an existing pennyworth; so, accepting the above two practical objections as insurmountable, it seems certain that the actual new penny must be the 5-cent half-dime, valued at 1·2d.

Your readers will notice that the smaller coins only are affected, and with them every small transaction. The poor, and men and women of moderate means, will pay for the privilege of decimalisation of the British coinage. Fluctuations in prices do not affect the issue, as that great statesman, Mr. Gladstone, plainly saw. Whatever the current prices at the time of the passing of the Act may be, the new penny will NOT be accepted as the equivalent of the present penny; and the next coin is nearly a penny-farthing, in present values.

The most curious thing in the tangle is the inability of decimalists to perceive that for the purposes of accounting of all kinds, for wholesale and foreign trade, and in large transactions, they possess an invaluable decimal currency already. If the sovereign is divided into 1,000 imaginary cents of account, NOT COINED, the matter is perfectly clear. Sums can be stated, and books kept, in pounds, florins, and decimals of florins. For practical use, in home payments of all kinds, there would exist the sovereign of 1,000 cents, the half-sovereign of 500, the crown of 250, the half-crown of 125, the florin of 100, the shilling of 50, the sixpence of 25, and the three-penny bit of 12½ "cents of account." For smaller sums only, the practical equivalent for a cent would be an existing farthing. We merely divide the three-penny bit into 12 convenient instead of 12½ inconvenient parts.

There is no case at all for "decimalisation," in either British currency or weights and measures. We have everything necessary for working in tens in both systems already. The agitation is purely artificial.—Yours, &c.,

E. A. W. PHILLIPS, M.INST.C.E.

Hove.
February 15, 1917.

THE SUGGESTED IRISH CONGRESS.

To the Editor of THE SURVEYOR.

SIR,—"Notes from Ireland" in the issue of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER for January 19th last contained some very practical suggestions for co-operation among members of the Institution of Municipal and County Engineers in Ireland, and, in fact, for members of the engineering profession in Ireland generally.

A good deal could be done to make the professional work which usually falls to the lot of the average surveyor engaged by local authorities more interesting and instructive by a broadening of ideas accomplished by frequent conferences and annual congresses. Take, for example, the amount of good which would result from, say, a discussion as to the methods, &c., adopted by the several district councils in Ireland in the carrying out of work under the Labourers' Acts. I suggest that such a national question could be solved more easily by a national congress.

In order therefore to help the project contained in the former issue of your paper, I ask that all engineers, architects and surveyors in Ireland who would be willing to assist in bringing such a congress together and help in its initial stages, communicate with Mr. Sellars, town surveyor, Dundalk. I am taking for granted that Mr. Sellars would be willing for the time being to act as secretary.—Yours, &c.,

PATRICK COUGHLAN.

Mitchelstown.
February 16, 1917.

Stockton's Proposed Municipal Piggery.—Provided the sanction of the Local Government Board is obtained, Stockton is to try the experiment of a municipal piggery.

Junior Institution of Engineers.—At a meeting of this body, to be held this (Friday) evening, at 7.30, a paper, entitled "Random Notes on Structural Design," will be presented by Mr. C. G. D. Burdett.

Rosyth Town-planning Scheme.—It was stated in the House of Commons, in answer to a question, that the Rosyth town-planning scheme had not yet been approved, for reasons already given, but that no avoidable delay would occur in proceeding with its consideration.

A War Office Gift. Esher and the Dittons Urban District Council have accepted from the War Office the gift of an 8·8 mm. field gun, which was taken in action in France. Subject to the approval of the Lady of the Manor, H.R.H. the Duchess of Albany, the gun will stand on the Esher village green, on a site overlooking the main Portsmouth road.

Building Licences. Replying to a question in the House of Commons, the Minister of Munitions stated that he was obliged to consider for the future a further limitation of building licences, and added that it would be of great assistance if applications even for small amounts were limited to those required for urgent repairs or for work of national importance.

The Metric System. The annual conference of the Association of Chambers of Commerce will be asked to approve a resolution urging the Government to introduce the metric system as early as possible, and to represent to Canada, Australia, and South Africa that it would assist the trade of the Empire if they adopted legislation on the same lines. It is also suggested that the Government should ascertain from Russia and the United States whether they can take similar steps, so that the system of weights and measures may be uniform in all the civilised countries of the world.

Causes of Cracks in Concrete Roads.*

By A. T. GOLDBECK, Engineer of Tests, Office of Public Roads and Rural Engineering, United States Department of Agriculture.

It is the intent of this paper to treat merely of the causes of cracking of concrete roads in the light of our present knowledge of the subject. There are many phases of the question of cracking that might properly be brought out in a discussion, such as the effect of cracking on the life of the road, the expense of and best methods of the maintenance of cracks, and many other allied questions. All of these, however, have been avoided, and an effort has been made to treat only that phase of the subject suggested in the title.

When the internal stress in a material reaches the ultimate strength, failure ensues and manifests itself in various ways. In a brittle material like concrete a crack indicates that the ultimate internal resisting stress, whether it is tension, compression, or shear, has been exceeded, and therefore, in order to analyse the cause of cracks in a concrete road, we must first discover the cause of the high internal stresses existing at rupture. This is a difficult task, as the internal stresses in concrete and reinforced concrete pavements are very complex, and may be caused by a number of different phenomena acting simultaneously.

A concrete road slab is attacked by many forces which slide it, in part or as a whole, along its sub-base; which bend it and warp it; which subject it to impact and shear, and may even act within its interior to exert a disrupting effect. It is little wonder that concrete roads crack, since, due to the lack of experimental data, they are constructed without sufficient knowledge of the forces to which they will be subjected.

COMPLEXITY OF STRESSES.

Let the life of a slab in the road be traced from the day it is poured in order that the complexity of stresses to which it is subjected may be studied. For about ten days or two weeks after the slab is laid and while the concrete is hardening, it is the practice, for several reasons, to keep the surface thoroughly wet. In the first place, water is necessary to hydrate the more inactive particles of cement, and, moreover, it has been discovered that as long as concrete is kept wet its length changes but very little, provided the temperature remains constant. Any slight change that does take place due to moisture is favourable to the integrity of the concrete, because moisture expands concrete, and tends to produce small compressive stresses, owing to the frictional resistance at the sub-base against this expansive movement. Should the temperature rise during this initial period, additional expansion will result with increased compressive stress in the concrete. Even this combined compressive stress, however, is seldom likely to be very large during the initial stages of hardening and may be neglected, as the concrete is generally sufficiently strong in compression to withstand the small forces then being exerted. Should there occur a large decrease in temperature during this initial period, the concrete will contract, causing it to move with respect to its sub-base. The forces of friction thereby developed produce tension, and as green concrete is weak in tension a decrease in temperature, when the pavement is only a few days old, may cause cracks.

Suppose the road survives this initial period without mishap and is thrown open to traffic. Immediately it begins to dry out and due to this cause it starts to shrink. The friction forces at the base immediately resist this shrinkage, and the result is tension in the concrete. If the tension is too great, the concrete cracks where the tensile strength of the concrete has been exceeded. As the seasons of the year succeed one another, the slab is alternately wetted and dried, and in addition subjected to a wide range of temperatures, being thus kept in constant motion over its sub-base. The forces of friction are therefore in constant action resisting this motion, and thus cause stresses, now tensile, now compressive, to exist in the concrete. Should the forces of friction be sufficiently great, the resistance of the concrete is overcome, and it fails, either in tension or compression, with one of two results, the concrete is cracked, or else bulged up or crushed. Sometimes moisture and temperature aid one another, and sometimes they counteract one another, but their activities are never ended during the existence of the road. Naturally, as friction can best be developed along the length of the road, temperature changes and moisture are promotive of transverse cracks rather than longitudinal cracks.

BENDING STRESSES IN THE SLAB.

In addition to direct compressive and tensile stresses, road slabs are subjected to bending, due to the loads of traffic and more likely to unequal settlement of the sub-base, caused by lack of homogeneity. Ununiform reaction between the slab and the sub-base due to frost may also produce cracking, the slab then being supported in some spots and not in others, thereby creating large tensile stress in bending. Frost action is more likely to cause longitudinal cracks than transverse cracks. The expanding and shrinking of the sub-base, due to varying moisture content, is also promotive of bending stresses and consequent cracking in the concrete.

In a general way the foregoing discussion treats of some of the causes of cracking of concrete pavements, and these causes can best be classified as follows:—

1. Expansion and contraction. (*a*) Change in temperature; (*b*) change in moisture content.
2. Ununiform bearing under the slab. (*a*) Frost action; (*b*) lack of homogeneity in sub-base; (*c*) moisture expansion and shrinkage of the sub-base.
3. Excessive bending stress due to heavy loads and impact.

These causes will be considered in detail so far as our present knowledge will permit.

EXPANSION AND CONTRACTION.

(*a*) Change in temperature: It has been well established by several investigators that concrete expands and contracts as the temperature changes, and the amount of movement equals 0·0000055 in. per inch of length. If a concrete road is built in the summer season when the temperature is 90 deg. Fahr. and the temperature in the following winter falls to 0 deg. Fahr., the concrete must contract an amount equal to $0{\cdot}0000055 \times 90 \times 0{\cdot}00495$ in. per inch of length. This contraction could do no harm if it were not for the resistance offered by friction between the sub-base and the slab. When the concrete contracts, the friction at the base resists the contraction and the amount of tension produced in the concrete is dependent on the amount of friction acting. Friction at the base varies with the kind of base, and the degree of roughness and tests recently made by the author throw some light on the amount of friction that can act at the sub-base when the slab expands and contracts.

Frictional Resistance of Concrete on Various Sub-bases.

Kind of base.	Movement.	Force.	Coefficient.	Movement.	Force.	Coefficient.	Movement.	Force.	Coefficient.
Level clay	0·001	480	0·55	0·01	1,130	1·3	0·05	1,800	2·07
Uneven clay	0·001	500	0·57	0·01	1,120	1·29	0·05	1,800	2·07
Loam	0·001	300	0·34	0·01	1,030	1·18	0·05	1,800	2·07
Level sand	0·001	600	0·69	0·01	1,080	1·24	0·05	1,200	1·38
Fine gravel	0·001	450	0·52	0·01	960	1·10	0·05	1,100	1·26
Fine broken stone	0·001	380	0·44	0·01	800	0·92	0·05	950	1·09
Coarse broken stone	0·001	1,060	1·84	0·01	1,550	1·78	0·05	1,900	2·18

* Paper read before the American Society for the Advancement of Science.

FRICTION AT THE SUB-BASE.

The tests referred to above were made by sliding 2-ft. × 6-ft. × 6-in. concrete slabs along previously prepared sub-bases. The sliding force was applied by means of a long lever, and the magnitude of the force was measured with a carefully calibrated dynamometer. The amount of movement of the slab was read with a Berry strain gauge while the load increased slowly and steadily.

As the load was applied, the slabs seemed to move very slightly, even at the first application, except where a sub-base of large broken stone was used. In this instance a high load was necessary to start the slab in motion, after which it required no more load than some of the other bases. Apparently there does not exist a constant value for the coefficient of friction, for the greater the displacement the greater the force of friction becomes.

The values of the frictional resistance offered at various displacements are given in the foregoing table.

When the slab on the loam base had been slid 0·035 in., the then existing load of 1,600 lb. was released to zero, and the slab recovered 0·047 in. of its motion. From this recovery behaviour it is seen that the sub-base acts in a somewhat elastic manner, and some of the resistance offered to the expansion and contraction of the slab must be that necessary to deform the sub-base. The material of the sub-base is far from being perfectly elastic, and it must, therefore, gradually yield under a slowly-applied load, such as would obtain in the expansion and contraction of concrete pavements. Hence it is not at all reasonable to assume that the maximum friction shown in the tests described actually exists in concrete pavements, even where their movement is large. The above tests were made in periods of about ten minutes each, while the corresponding movements in the road might take days.

MOISTURE SHRINKAGE.

When a specimen of concrete is permitted to harden under continually moist conditions, it expands slightly; on the other hand, shrinkage takes place when it hardens in a dry atmosphere. The amounts of expansion and contraction are dependent to some extent on the richness of the mixture and also on the thoroughness of the drying. For instance, consider the experiments on two specimens, 1:2:4 and 1:3:6 concrete, of very wet and very dry consistency. Several days after hardening they were immersed in water, and extensometer readings were made on them at frequent intervals. As long as they were wet they remained expanded, with the maximum expansion of 0·0001 in. per inch of length. After six months they were removed from the water and allowed to dry out in the warm, dry air of the laboratory, when they immediately began to contract, reaching an ultimate contraction of 0·0008 in. per inch of length. It must be emphasised, however, that these specimens became exceedingly dry in a very short time after their removal to the air of the laboratory, and probably very much dryer than they could ever become in the road.

When specimens are subjected to the every-day wet and dry weather conditions, they do not change in length very much due to change in moisture content, because their moisture content does not vary greatly under such conditions. Concrete in the road may, under exceptional conditions, be made to suffer extreme drying, but it is very probable that most concrete roads absorb much water by capillarity from the damp or wet underlying sub-base, and moreover, the water that is absorbed during a period of wet weather does not completely evaporate between successive spells of wet weather. However, there is sufficient evaporation from the surface to cause some shrinkage of concrete in the road, as evidenced by the formation of cracks when road slabs are allowed to dry out too quickly. The maximum amount of shrinkage that concrete can reach is 0·0008 in. per inch of length, but it is probable that, in general, the moisture shrinkage of concrete road slabs does not exceed more than 0·0004 in.

COMBINED MOISTURE AND TEMPERATURE CHANGES.

It is evident, therefore, that both moisture and temperature act to cause creeping of the slab in the road, and it must be realised that the relative magnitude of these two effects depends on the range of temperature, on the rainfall and on the drainage of the sub-base. In an exceptionally well-drained sub-base and in a dry climate the moisture shrinkage of the concrete will be large, and will add to the contraction due to changes of temperature. This shrinkage may amount to 0·0004 in. per inch of length, and if there is a decrease in temperature of 100 deg. Fahr. there will be an additional shrinkage of 100 × 0·0000055 = 0·00055 in. or a total shrinkage of 0·00095, or, roughly, 0·001 in. for each inch of length. On the other hand, there may be much moisture in the sub-base which will keep the concrete expanded 0·0001, and the net shrinkage will then equal 0·00055 −0·0001, or only 0·00045 in.

It has been pointed out that the sliding of concrete along the sub-base develops frictional resistance of considerable magnitude, and when the tension developed in the concrete due to the forces of friction exceeds the tensile strength of the concrete a crack must form. Let the coefficient of friction be equal to 1·0, and assume the tensile strength of the concrete to be 150 lb. per sq. in. Let L equal the distance between cracks, then, in a slab 12 in. wide and 6 in. thick, the stress at rupture equals 72 sq. in. × 150 lb. = 10,800 lb. This stress must be supplied by the forces of friction acting over the distance between cracks, or fLw = 72 sq. in. × 150 lb. per square inch where w equals the weight of the concrete per linear foot. This equation reduced to 1·0L72 = 72 × 150 or L = 150, the distance between cracks. If f = 2·0, then L = 75 ft., so that the greater the friction the closer will be the spacing between cracks.

The above calculations indicate the advisability of forming the sub-base as smoothly as possible. Of course, the tensile strength of the concrete cannot obtain unless the concrete is stretched sufficiently. When 150 lb. per square inch exists in the concrete, each inch is stretched 150/3,000,000 = 0·00005 in., and it has been shown that the shrinkage due to moisture and temperature change may amount to 0·00095 in., far in excess of the amount required to cause rupture.

The foregoing considerations are based on mature concrete. When the concrete is only a few days old, the tensile strength is very small indeed, and the modulus of elasticity is likewise low. When but two days old the tensile strength may be as low as 50 lb. per square inch, and the modulus of elasticity in tension may be only 1,000,000. The stretch required to produce rupture is then 50/1,000,000 = 0·00005. This amount of shrinkage could readily be caused by slight drying out, or by a decrease in temperature of only 0·00005/0·0000055 = approximately 9 deg. Fahr. A comparatively small decrease in temperature may thus produce cracking in the concrete pavement. If the tensile strength at two days is only 50 lb. per square inch, the distance between cracks, when the concrete contracts sufficiently, will be smaller than it is if the concrete cracks at a later period when it has attained higher strength. Assuming the same values for friction and weight of concrete as before, we have fLw = 50 × 72, or 1·0 × L × 72 = 50 × 72, whence L = 50, if the coefficient of friction equals 2·0. There may be times, due to a big fall in temperature just after the concrete has hardened and the tensile strength is exceedingly low, when the cracks will be much closer together than the above figures show. There are often cases when the sub-base contains projections and depressions that greatly add to the frictional resistance offered to sliding, and such a sub-base aids in the production of cracks at close intervals.

FIELD MEASUREMENTS.

In order to gain some idea of the actual changes in length which takes place in the road slab in place, many field measurements have been made by the Office of Public Roads and Rural Engineering. In general, the expansions and contractions were found to follow closely the temperature changes.

UNIFORM BEARING UNDER THE SLAB.

Irrespective of what may cause lack of uniformity of bearing under the slab, let it be assumed that, due to some cause, this unequal support exists. As an exaggerated case, let it be assumed that the slab is largely supported at its two sides, and acts therefore as a single beam. Assume a 16-ft. roadway 6 in. thick. The fibre stress in the section of greatest bending moment then equals—

$$S = \frac{Mc}{I} = \frac{WL}{8} \times \frac{6}{bd^2} = \frac{72 \times 16 \times 16 \times 12}{8} \times \frac{6}{12 \times 36} = 384 \text{ pounds per square inch}$$

This value is close to that of the modulus of rupture of the kind of concrete used in road construction.

The dead weight of the road alone is thus almost sufficient to cause cracking if the slab is afforded improper support. The same condition would hold if the pavement were supported at the sides but fully supported at the centre. Add the weight and impact of traffic to increase the bending moment due to dead load and it will be readily seen that, under the right conditions of improper subbase support, a longitudinal crack is likely to form.

Before considering these conditions producing improper support let the amount of deflection of the slab at rupture be figured. In a simple beam uniformly loaded the deflection at the centre

$$D = \frac{5}{384} \frac{WL^3}{EI}.$$

Assuming a beam 12 in. wide, and supported at its sides, the deflection under its own weight equals

$$\frac{5}{384} 72 \quad 16 \frac{(16 \quad 12^3}{3,000,000} \times \frac{12 \times 6}{12} = 0{\cdot}164 \text{ in.}$$

The slow yielding or "flow" of concrete acts to increase this by one and might even treble it, thereby making the possible deflection as much as 0·5 in. when the crack forms.

Regarding the causes of unequal bearing, nothing very definite may be said. It is generally recognised that unequal compaction of the sub-base, due to lack of homogeneity and to uniform rolling, may cause more settlement in some spots than in others, and many subbases built of old Telford or macadam roads are very likely to lack uniformity. Again, the well-known expansive effect of freezing can very readily act with different intensity in different parts of the road, thereby causing more than enough rise to produce cracking. The shrinkage of soils when they dry out, and their swelling when moistened, is an occurrence of every-day observation, and it is quite possible that the shrinkage of the foundation away from the concrete is sufficient in places to cause great bending stress, with the formation of cracks in the concrete. The raising of the sub-base in spots need not be more than 0·2 in. to cause cracking, and the expansive effect of the frost and the swelling and shrinkage effect of moisture on the sub-base may be considerably more than this. The writer now has some experiments in progress to show the effect of freezing and moisture on the vertical movement of the road.

IMPACT OF TRAFFIC.

The weight of traffic serves but to accentuate the stresses due to the other physical causes. Heavy loads on a thin slab, or where the bearing is not uniform may cause either transverse or longitudinal cracks, and when these loads are applied suddenly or with impact, as is the case with the modern heavy truck and steel-tyred trailer, these loads will aid the other causes of cracking, although they may not be severe enough to be effective themselves. Traffic, however, often breaks off the corners of slabs, the load then being concentrated near a point having poor bearing.

In conclusion, it must be emphasised that a great effort should be exerted to protect the concrete during its initial stages of hardening. Do not mix it any more than necessary to obtain smooth yet economical construction. Protect it from sudden losses of temperature and keep it wet for at least two weeks in order to prevent undue shrinkage while the concrete is young. Much attention should be given the subbase for as has been pointed out the friction at the base causes transverse cracks. This friction may be greatly reduced by proper care in the preparation of the subbase, and in this way the cracks may be greatly distributed if not entirely eliminated. In addition provide proper drainage to keep the moisture away as possible so that the effect of frost and the settlement due to moisture may be minimised. Finally design the slab as to thickness to carry the loads it is supposed to carry, irrespective of whether the subbase offers uniform bearing or not.

Liverpool City Engineer's Department and the War. The city engineer's department of the Liverpool Corporation has contributed a total of about £100 each to the funding loans. Of that number forty have now laid down their lives. The gallant record (the *Liverpool Post and Mercury* says) was a matter of comment recently at a meeting of the Health Committee when the deaths in action of three of the city engineer's former staff were regretfully reported.

AN URBAN SURVEYOR'S "SALARY."

HOW THE L.C.B. PAYS.

At the last meeting of the Aspatria, Cumberland, Urban District Council, Mr. Pennington (the *Whitehaven News* reports) moved they give an increase of £15 to the surveyor. At present he was paid £50 as inspector and £30 as surveyor. On looking into the salary and seeing the amount of work done, he felt it a disgrace to the council.

The chairman: Don't put it so strong. (Laughter.)

Mr. Pennington: Well, I never thought the salary was so small. The surveyor should have at least £2 per week.

The clerk pointed out they got half the inspector's salary from the Local Government Board. He thought they ought to apportion the salary, £10 for the inspector and £5 for the surveyor.

The medical officer: Better put it all on the inspector's salary. (Laughter.)

The clerk: I was thinking that.

The medical officer: They would not object.

Mr. Stoddart: What is the war bonus?

The clerk: 3s. per week.

Mr. Pennington: I did not take that into account, because it will probably cease with the war.

Mr. Ostle: Is it up to £2?

Mr. Pennington: Not yet.

Mr. Ostle: Level it up then.

Mr. Stoddart said he would not put it so strongly as Mr. Pennington, but £15 increase was not too much. He had great pleasure in seconding.

The chairman suggested £5 for the surveyor and £15 for the inspectorship.

Mr. Pennington agreed to this, and it was decided to give an advance of £20.

STATE CANALS.

BOARD OF TRADE TO TAKE POSSESSION.

A Regulation under the Defence of the Realm Act has been made enabling the Board of Trade to take possession during the war of any canals in the United Kingdom.

The Board of Trade are about to make an Order under the new Regulation taking possession of such of the non-railway-owned canals as are required for essential traffic. They propose to appoint an executive committee to control the canals on their behalf.

The expression "canal" in the new Regulation includes all buildings, barges, machinery, and plant used in the working of the canal.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATIONS FOR LOANS.

Birmingham Tame and Rea District Drainage Board. £10,000 for the construction of additional sludge-drying beds.

Loughborough T.C. £27,225 for extensions at the electricity works, and £1,175, excess expenditure on the electricity undertaking.

Mansfield T.C. £490 for street improvement works.

LOANS SANCTIONED.

Dundalk U.D.C. - £3,000 for the electricity undertaking.

Kettering U.D.C. - £950 for the purchase of a motor fire engine.

INQUIRY HELD.

FEBRUARY.		£
27.	**Hoylake.** For the purchase of a motor fire engine (Mr. A. G. Drury) ...	1,100

Business Announcement. We are informed that the Woods-Gilbert (British) Rail Grinding and Milling Company, Limited, has been formed for the purpose of acquiring from the Woods-Gilbert Rail Planer Company, Limited, of Melbourne, all the assets, liabilities and goodwill of the business hitherto carried on by them in Great Britain, and they have accordingly taken more convenient premises at 170 Strand, London, W.C., to which all further communications should be addressed.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Bucks C.C.—Application is to be made to the Local Government Board for powers to establish a joint isolation hospital for the districts of Beaconsfield, Chesham, Marlow, Slough, Amersham, and Wycombe.

Grimsby T.C.—The Electricity Committee propose to build stores and a workshop in Moss-road, at an estimated cost of £60.

Hove T.C.—With respect to the purchase of the Hove baths and laundry premises, the Local Government Board write that they will not be in a position to sanction a loan at present. They suggest the holding of a local inquiry, so that in the event of the proposals being considered satisfactory a loan might be authorised when circumstances permitted.

Newton Abbot U.D.C.—The tender of Messrs. Hugh Mills & Son, at £385, has been accepted for the alteration of the stone depot in the Avenue.

HOUSING AND TOWN PLANNING.

Coatbridge T.C.—The Housing and Town Planning Committee have received authority to prepare a housing scheme for forty houses.

Killarney R.D.C.—The council are seeking to raise a supplemental loan of £3,800 for the completion of their housing scheme.

Rhymney U.D.C.—With respect to the finances of the council's housing scheme, a letter has been received from the Local Government Board stating that the council were not legally entitled to charge an increased rent in respect of their houses in the local garden city, and that whatever deficiency there might be in the rents to meet the repayment of the loan should be made up from the general district fund. A claim was made by one of the tenants for 13s. 9d., being the sum of the increased rent paid by him. In view of the letter from the Local Government Board it was decided to refund the amount.

Sedgley U.D.C.—The council have prepared a scheme, to be carried out after the war, for the provision of fifty houses for the working classes, at an approximate cost of £12,000.

MOTOR TRANSPORT.

Bucklow R.D.C.—The council have decided to purchase a 5-ton Yorkshire steam wagon and two side-tipping trailers.

Dumbarton T.C.—The town council have agreed to contribute £25 towards the purchase of a motor ambulance by the business firms of the town.

Dundee T.C.—The Police Committee have decided to purchase a motor tractor for the fire escape.

Glasgow T.C.—The Tramways Committee are inviting tenders for the supply of an electrically propelled vehicle for the department.

Kensington B.C.—The Highways Committee have been considering a proposition to make use of motor brooms for road sweeping, but, having regard to the difficulty of obtaining drivers and the high price of petrol, they have adjourned the matter for six months.

Manchester T.C.—The Government have given the necessary authority to the city council to obtain the equipment for the maintenance of the plant, motor vehicles and rolling stock used in the public health services.

Newton Abbot U.D.C.—The surveyor has been instructed to apply to the Ministry of Munitions for permission to obtain immediate delivery of a steam lorry for the cartage of road material.

Perth T.C.—The purchase of a motor refuse wagon for the cleansing department is being considered by the council.

Salford T.C.—The Lighting and Cleansing Committee recommend the acceptance of the tender of the Austin Motor Company, Limited, at £747, for a 2 3-ton tipping wagon.

Sheffield T.C.—The corporation have purchased two second-hand Commer cars, one for £260, the other for £278, for removing clinker. It has also been decided to buy two second-hand generating sets and condenser for £810, and two battery equipments for charging electric vehicles.

Walsall T.C.—It has been decided to purchase a second-hand chassis and fit it up as a motor parcel van, at a cost not exceeding £300.

Warrington T.C.—It is proposed to purchase a steam tipping wagon for the sanitary services.

ROADS AND MATERIALS.

Burntisland T.C.—A sum of £250 has been included in the estimates for tar-spraying work.

Caistor R.D.C.—The council have accepted the tenders of Messrs. Ellis & Everard, Messrs. M. Jackson & Son, Messrs. Ord & Maddison, and the Mountsorrel Company, for the granite required for the coming year, and the tender of Messrs. Atkinson & Son for slag and tar-macadam.

East Grinstead R.D.C.—The council have accepted the tenders of Messrs. Forbes, Abbott & Leonard, and Messrs. Catchpole & Son, at 3¾d. per gallon, for the supply of tar, delivered to the various stations. They have also accepted the tender of the Tar Road Syndicate, at 2 9/20d. per square yard, for tar-spraying.

Newton Abbot U.D.C.—The tender of Messrs. Fothergill Brothers has been accepted for tar-spraying, at 1 11/16d. per super. yard, on condition that the county council consent to contribute one-half the cost of the work.

Paignton U.D.C.—In commenting upon the half-year's estimate of £1,587 for road maintenance, the chairman of the Roads Committee stated that a lot of tar-spraying would be needed, and considerable expense incurred in street watering, in the event of a dry summer.

Pateley Bridge R.D.C.—The council have approved the action of the surveyor of highways, Mr. W. Storey, in offering four hand-scrapers to the War Office at 11s. each.

St. Thomas R.D.C.—It was reported that, owing to the large demand for German prisoners for labour, it was impossible to allocate any for work on the roads. The chairman, Mr. J. H. Ley, said they would probably have seventy German prisoners in that district. Arrangements were being made at Topsham for their reception. That meant that the St. Thomas Council must try to get their men from that group. He understood that only 275 had been allocated to Devon.

SEWERAGE AND SEWAGE DISPOSAL.

Alton U.D.C.—The council have been asked by the Local Government Board to submit their proposals as soon as possible with respect to the sewerage works for which they are seeking sanction to a loan of £37000.

Camberwell B.C.—The borough engineer, Mr. W. Oxtoby, has submitted a report with reference to a subsidence of the roadway in Camberwell-grove. It was found that the subsidence was caused by a stoppage in the sewer through several of the pipes having collapsed, the earth having washed away in small quantities until it reached the surface of the roadway, which then caved in. There is no doubt this had been going on very gradually for many years, as no abnormal deposits were discovered in the outlet sewers through which it must have passed. The defective portion of the sewer has been reconstructed, and a manhole been brought up to the surface of the roadway, so that the three pipes which meet at this spot will now be under constant inspection and control. The cost of the work will be about £250.

Mansfield T.C.—The War Office having taken two 200-gallon sludge carts from the corporation, and undertaken to replace them, the council decided to purchase two 250-gallon carts in their place.

WATER, GAS, AND ELECTRICITY.

Barnes U.D.C.—The chairman of the Electricity Committee and the electrical engineer have been appointed to attend a conference to be convened by the Ealing Corporation on the question of a bulk supply of electricity. A resolution has been passed by the council protesting against the demand made by

the Metropolitan Water Board for the payment by March 31st of £4,053, the council's share of the board's deficiency. It was stated that, as the council had received no prior information with respect to the matter no provision had been made in their estimate for such a sum.

Kirkcaldy T.C.—The manager of the gasworks recommends the council to extend the purifying plant.

Leeds T.C.—A deputation has been appointed to visit London and Nottingham in order to inspect briquetting and other plant for the utilisation of coal dust.

Llanelly R.D.C. An arrangement has been made with the Llandilo Rural District Council under which the latter authority will supply Tycroes with water by meter.

Monifieth T.C. The council have agreed to a recommendation of the Gas Committee that, commencing as from May 15th next, the price of gas for industrial purposes, including the ordinary 5 per cent discount for prompt payment, should be subject to an extra discount of 5 per cent when the annual consumption is between 20,000 ft. and 35,000 ft., 7½ per cent for annual consumption between 35,000 ft. and 50,000 ft., and 10 per cent above the latter figure. For the current year a total discount of 15 per cent will be allowed, irrespective of the amount consumed.

Penzance T.C.—A suggestion by the borough surveyor, Mr. F. Latham, that a large meter and fittings should be placed on one of the 12-in. water mains with a view of checking waste, has been referred to the town council in committee.

Sheffield T.C.—The Electricity Supply Committee have authorised the general manager to engage temporarily six draughtsmen and such technical assistance as may be required for the preparation of plans and specifications for the building and equipment of the new power-house at Blackburn Meadows. The committee also authorised the suggested extension of the drawing-office accommodation at Commercial-street to be carried out.

Stockport T.C. The Gas Committee have asked the engineer to prepare an estimate of the cost of installing a tar-distilling plant at the gasworks. A sub-committee have been requested to report upon the extensions to be made at the works after the war.

MISCELLANEOUS.

Lowestoft T.C. The borough surveyor, Mr. G. H. Hamby, has submitted a report on the damage done to the sea wall by storms, showing that a sum of £5,276 will be required for new works, and the town council have resolved to approach the Local Government Board with a view to obtaining a loan for that amount.

Monifieth T.C.—It has been agreed to offer the office of the burgh surveyor as a place of accommodation for the interviewing of recruits under the scheme of national service, and the matter of clerical assistance was referred to a committee to arrange.

Paignton U.D.C.—It was stated that considerable expenditure would have to be incurred to repair the damage to the sea wall, but that the council had £1,569 in hand for the work, which would more than meet the cost.

Torquay T.C. The corporation are about to reap advantage from their afforestation scheme on the watershed, arrangements having been made for the sale of a portion of the timber.

Surbiton's Electric Dust Vans.—The manufacturers are proceeding with the construction of one of the two electrically driven dust vans, for sanction to the purchase of which by instalments, Surbiton, Surrey, Urban District Council recently made application to the Local Government Board. At the last meeting it was reported that the board did not see its way clear to sanction the purchase of the two electric dust vans by means of instalments, and the alternative scheme had been adopted—*i.e.*, to purchase one vehicle for cash this year and to hire a second vehicle, on the understanding that it would be purchased by cash at the expiration of one year. The clerk stated that by direction of the chairman of the council he had written to the Local Government Board regretting that it was unable to grant the council's application, and adding that, in view of the very serious position in which the council was placed over its dust removal difficulty, it had no alternative but to secure the electric dust vans in any other way that was open to it.

PERSONAL.

Mr. E. Lynch has been appointed assistant county surveyor of Galway.

Mr. F. Dowling, B.E., has been unanimously appointed town surveyor of Ennis.

Mr. R. Curtis Corden, highway surveyor to the Bucklow Rural District Council, has been voted an increase of salary.

Mr. W. Davey, surveyor to the Brandon (Suffolk) Rural District Council, is leaving to take up Army road work in France.

Mr. M. W. Wickett, road surveyor to the Plympton Rural District Council, has obtained a commission in the Royal Engineers for road work in France.

Mr. J. W. B. Blackman, city engineer of New Westminster, British Columbia, has received a commission as Lieutenant in the Canadian Railway Construction Company.

Mr. Henry Stewart, assistant burgh surveyor of Aberdeen, has received a commission as Lieutenant in the road making corps, and the town council have agreed to make up his salary to its present figure.

Mr. W. F. Loveday, borough surveyor of Stoke Newington, has accepted a commission as Captain in the Road Construction Companies, Royal Engineers, and Mr. C. L. Strike, the assistant surveyor, has been appointed acting surveyor during Mr. Loveday's absence.

Mr. J. R. Sobey, surveyor for the Southern District of the Liskeard Rural District Council, was welcomed back recently to the council meeting after a serious illness, the chairman, Mr. M. West, stating that Mr. Sobey had missed a council meeting only once in thirty-four years.

Mr. E. A. Sandford Fawcett, deputy chief engineer of the Local Government Board, who acted as secretary of the Man-Power Distribution Board, has been appointed chief assistant to the Director-General of National Service. Mr. Fawcett will also act as principal private secretary to the Director-General.

Mr. J. Young, manager of the Newport (Mon.) tramways undertaking, and Mr. A. Nicholls Moore, electricity works manager, have had their salaries increased from £400 to £500; Mr. W. T. Bond, waterworks department, from £275 to £300; and Mr. T. Leveson, waterworks department, from £130 to £150.

Mr. W. W. Gladwell, who has held, at a salary of £300 a year, the office of county surveyor of Norfolk temporarily since the death of Mr. Heslop, is recommended for the permanent position by the Western Highways Committee, at a salary of £400, rising to £500. The proposition has to be confirmed by the county council.

Mr. Peter Fyfe, chief sanitary inspector of Glasgow, gave a lecture, entitled "A Tour in the Calton," at the Old Glasgow Club, last week. For sanitary and housing purposes he advocated dealing with the city in sections. This, he said, was the basic principle of the housing scheme proposed by the town clerk, Sir John Lindsay.

Mr. George Green has been appointed by the Wantage Urban District Council to carry out the duties of surveyor during the absence of Mr. T. C. Betts on military service. Mr. Green, who will be paid £70 a year, has received a vote of thanks from the council for voluntary service during the past month.

Mr. W. G. Peirce, who has for over forty years been water engineer under the Richmond (Surrey) Town Council and their predecessors the Richmond Vestry, has resigned, owing to advanced age, but his services are to be retained as consulting engineer from April 1st next at an annual salary of £250. The Water Committee recommended, in addition, "with residence," but this was not carried.

Mr. J. Siddalls, borough surveyor of Tiverton, and his staff, were congratulated recently at the town council meeting by Alderman Deering, chairman of the Streets Committee, on the manner in which they have during the past two years carried through their duties, under difficulties, with a diminished staff. The town, he said, had been well kept, and it was due to them that this testimony should go forth. Every eligible member of the borough surveyor's staff, both outdoor and office, are on active service,

no less than 80 per cent having joined up, either in the Army or in the Labour Battalions.

Mr. Charles T. Ruthen, who has been selected, in conjunction with Mr. Leonard R. Powell, J.P., to fill the position of honorary inspector to inquire into the utilisation by the Government Departments of their office accommodation, is a well-known Swansea architect and arbitrator. The appointment has been made by the Accommodation Committee, of which Sir Alfred Mond, as First Commissioner of Works, is chairman. Mr. Ruthen, who is forty-five years of age, is a native of South Shields, and after serving his articles as architect and surveyor in that town he went to Swansea in 1890 as assistant in the borough surveyor's office. Six years later he started in practice in the town, and since then has been engaged in many works of the first magnitude, including the buildings named above. He is one of the pioneers of a comprehensive, broad idea in the treatment of the important subject of housing in South Wales. During the past few years the bulk of his time has been occupied in arbitrations.

KILLED IN ACTION.

Private Frank Cross, of the Royal Fusiliers, who was articled to Mr. John Brooke, surveyor to the Northwich Urban District Council, has, we regret to state, been killed in action.

Mr. Alexander Hogg, county road surveyor, Elgin, has received intimation that his son, Second-Lieutenant David A. Hogg, Highland Light Infantry, was killed by a shrapnel bullet on the 9th inst. Second-Lieutenant Hogg was road surveyor of the County of Zetland, and joined the Sportsmen's Battalion shortly after the outbreak of war. He received a commission in the Highland Light Infantry after the capture of Delville Wood.

OBITUARY.

Mr. John R. Smart, who was for many years identified with the Dundee city water supply in the capacity of Inspector, died recently, we regret to state, aged about sixty.

The death has occurred, after a short illness, of Mr. Tom Rudd, senior partner in the well-known Carlisle firm of bowling-green experts, who have laid sea turf greens for municipal bodies and private clubs in all parts of Great Britain. He was only forty-five years of age.

FOR OTHER ADVERTISEMENTS
See End of Paper.

SEVENOAKS RURAL DISTRICT COUNCIL.

TENDERS FOR MATERIALS, TEAM LABOUR, &c., IN CONNECTION WITH THE REPAIR OF HIGHWAYS.

YEAR ENDING 31ST MARCH, 1918.

The Rural District Council of Sevenoaks invite Tenders for

(1) The Supply of Chert, Flints and Ragstone on to the various Roads in the District. (2) The Supply of Granite, Quartz, &c., Basalt, or other approved Hardstone, to various Stations in the District. (3) Team Labour and Cartage. (4) Haulage from Stations and Quarries, for the year ending 31st March, 1918.

Specifications, Conditions of Contract, Schedule of Quantities, with Form of Tender, may be obtained on application at my Office, or from Mr. R. Bailey, Sundridge, Sevenoaks, and Mr. J. Randerson, Leigh, Kent, Surveyors to the Council. Persons applying for Form should state which they require.

The Council do not bind themselves to accept the lowest or any Tender, and they reserve to themselves the right to accept such part of any Tender as they may deem proper.

Samples of Materials to be delivered, carriage paid, at this Office, Sevenoaks, and Sealed Tenders, marked "Tenders" on the outside of the envelope, to be returned, with the conditions intact, to me, on or before Saturday, the 10th March, 1917.

(By order of the Council)
F. H. VIBERT,
Clerk to the Council.

Bank Chambers,
82 High-street, Sevenoaks.
February 21, 1917. (3,323)

HARROW-ON-THE-HILL URBAN DISTRICT COUNCIL.

The above Council invite Tenders for:—

(a) The Supply of about 30,000 gallons of Distilled Tar, delivered in barrels to the Harrow Metropolitan Station.

(b) Tar Painting about 40,000 sq. yards of Road Surface. The Tar supplied under Contract (a), and that used under Contract (b) to comply with the Road Board Specification.

Endorsed Tenders to reach me on or before Saturday, March 3, 1917.

The lowest or any Tender will not necessarily be accepted.

JOHN STRACHAN,
Clerk.

Council Offices,
Harrow,
February 20, 1917. (3,325)

AYLESBURY RURAL DISTRICT COUNCIL.

TENDERS FOR MATERIALS

The Highways Committee of the Aylesbury Rural District Council invite Tenders for the Supply of Materials for the Maintenance of their Highways during the year ending March 31, 1918, approximately as follows:—

Granite, 2,350 tons; Furnace Slag, 600 tons; and Derbyshire Limestone, 300 tons.

Also 4,000 gallons of Refined Tar (to comply with Road Board Specifications), to be delivered to Stoke Mandeville Station (G.C.R.).

Forms of Tender and particulars may be obtained upon application to the undersigned, which must be delivered not later than first post Wednesday, March 14th, 1917.

H. G. CORDON, Highway Surveyor.

Council Offices,
21 Walton-street,
Aylesbury.
February 21, 1917. (3,326)

HORSHAM RURAL DISTRICT COUNCIL.

The above Council are prepared to receive Tenders for the Supply of the following Materials, for the year ending March 31st, 1918:—

Flints, 2,000 cubic yards,
Granite, 1,500 cubic yards.
Granite Chippings, 500 cubic yards.
Sand for use in Tar-dressing Roads, 200 cubic yards.

All particulars and Forms of Tender to be obtained of the Surveyor, Mr. W. Dengate, 58, Park-street, Horsham.

The Council do not bind themselves to accept lowest or any Tender.

Tenders, endorsed "Materials," to reach me, the undersigned, not later than Saturday, March 17th.

By order,
F. FRASER HADDOCK,
Clerk.

9, Carfax,
Horsham.
February 20, 1917. (3,324)

GELLYGAER URBAN DISTRICT COUNCIL.

TEMPORARY SURVEYOR'S ASSISTANT.

The above Council require a Temporary Assistant (not being eligible for military service) in their surveyor's office during the period of the war. Candidates should be neat draughtsman, able to make accurately small surveys, and preferably have had experience in a municipal office. Salary £120 per annum. Candidates who canvass any of the members of the Council will be disqualified.

Applications, stating age and experience, and enclosing copies of three recent testimonials, should be sent to me not later than 2nd March, 1917.

FRANK T. JAMES,
Clerk.

Council Offices,
Hengoed, Glam. (3,322)

SURVEYOR will undertake the tracing of Plans and Drawings, also Colouring. Reasonable charges.—Write Box 1,603, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (3,327)

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR.—March 3rd.—Penistone Urban District Council. The Clerk, Urban District Council, Penistone.

SANITARY INSPECTOR.—March 9th.—Caistor Rural District Council. £165 a year.—Mr. A. A. Padley, clerk, Council Offices, Caistor.

CITY SURVEYOR'S TEMPORARY ASSISTANT. Corporation of Salisbury. £104 per annum. Mr. Francis Hodding, town clerk, Municipal Offices, Salisbury.

ARCHITECTURAL ASSISTANT.—Ceylon Public Works Department. £300–£350. Crown Agents for the Colonies, 4, Millbank, London, S.W.

FOREMAN OF WORKS.—Public Works Department of Nigeria. £250–£300. Crown Agents for the Colonies, 4, Millbank, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

RICHMOND (Yorks).—February 27th. For the provision of an additional exit and lavatory accommodation at the town hall, for the corporation.—Mr. H. W. Marsden, borough surveyor, Finkle-street, Richmond.

LOUTH.—February 28th.—For the erection of bathrooms at the county infirmary.—Mr. V. J. O'Connell, architect, Earl-street, Dundalk.

TETBURY.—February 28th. For the erection of an engine-house, pump-house, gas-producer house, and other works, for the urban district council.—Mr. H. J. Weaver, superintending engineer, Northgate Mansions, Gloucester.

NORWICH.—March 1st. For general repairs to a certain property, for the corporation.—Mr. A. E. Collins, city engineer, Guildhall, Norwich.

SHEERNESS.—March 14th.—For the construction of pumping station buildings and other works, for the urban district council.—The Water Engineer, Trinity-road, Sheerness.

Engineering: Iron and Steel.

WOODFORD.—February 26th.—For supplying and fixing a steel vertical cross-tube boiler, for the urban district council.—Mr. W. Farrington, surveyor, Council Offices, Woodford-green, Essex.

SHEPSHED.—March 3rd.—For the supply of a Cornish boiler, for the urban district council.—Mr. M. Smith, clerk, Shepshed, Leicestershire.

HARROGATE.—March 5th.—For the supply at the electricity works of a by-product steam boiler, overhead coal bunker, coal conveyer, and structural steelwork, for the corporation.—Mr. G. Wilkinson, borough electrical engineer, 35, Swan-road, Harrogate.

MANCHESTER.—March 7th.—For the supply and erection of a coal-conveying plant and suction ash plant, for the electricity committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall, Manchester.

Mechanically Propelled Vehicles.

BRIGHTON.—March 9th.—For the supply of a steam motor sweeper and an electric motor watson, for the corporation.—Mr. H. Talbot, town clerk.

Roads.

HASTINGS.—February 26th.—For the supply of (2,000) gallons of refined or distilled tar or tar compounds, for the corporation.—Mr. P. H. Palmer, borough engineer, Town Hall.

KEYNSHAM.—February 26th. For the supply of granite slag, tarred macadam, and limestone, for the rural district council.—Mr. J. Johnson, district surveyor, Surveyor's Office, Keynsham, Somerset.

BREDBURY AND ROMILEY.—February 26th.—For the supply of setts, macadam, and other highway materials, for the urban district council.—Mr. Albert Plunkett, surveyor, Council Offices, Schoolbrow, Romiley.

EAST RETFORD.—February 26th. For the supply of granite, slag, tar macadam, and refined tar, for the rural district council.—Mr. Thomas Henry, surveyor, Market-square, Retford.

LANARK.—February 26th. For the supply of tar and tar macadam, for the Middle Ward. The Road Surveyor, Strathaven and Hamilton, Lanark.

LICHFIELD.—February 26th.—For the supply of granite, slag, chippings, carting, tools, and oils, for the rural district council.—The Surveyor, Council Offices, Station-road, Lichfield.

MARYLEBONE.—February 26th. For slopping for the year, commencing April 1st, for the borough council.—Mr. J. P. Waddington, borough surveyor, Town Hall, Marylebone, London, W.

LEYTON.—February 27th.—For watering, cartage, and horse hire, for the urban district council.—Mr. E. H. Essex, surveyor, Town Hall, Leyton, Essex.

OMAGH.—February 27th.—For road maintenance and other works, for the rural district council.—Mr. W. Cathcart, clerk, The Board Room.

BARTON-UPON-IRWELL.—February 27th.—For the supply of setts, kerbs, macadam, flags, limestone chipping, sanitary pipes, and road brushes, for the rural district council.—Mr. A. H. Mountain, surveyor, Council Offices, Patricroft, Lancs.

FLAXTON.—February 28th.—For the supply of whinstone and broken annealed and common slag, for the rural district council.—Mr. J. W. Lupton, surveyor, Chestnut-grove, New Earswick, York.

CHESHIRE.—February 28th.—For the supply of macadam, tar-macadam, and chippings, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

CHESHIRE.—February 28th.—For the supply of refined tar, Tarvia, or Tarco, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

CAMBS.—February 28th.—For the hire of steam rollers, for the county council.—Mr. H. H. Dunn, acting county surveyor, County Hall, Cambridge.

DISS.—February 28th.—For the supply of 530 tons of 2-in. and 2½-in. granite, 90 tons of 1½-in. and 1¾-in. granite, 70 tons of ½-in. clean chippings, and 65 tons of ¾-in. dust, for the urban district council.—Mr. Alfred Cooper, surveyor, The Terrace, Diss.

CASTLE WARD.—February 28th.—For quarrying, breaking, loading and laying on materials, for the rural district council.—Mr. D. Hope, surveyor, Ponteland, near Newcastle-on-Tyne.

STOCKTON-ON-TEES.—February 28th.—For the supply of road metal and carting, for the rural district council.—Mr. W. Heslop, highway surveyor, Norton, Stockton-on-Tees.

BURNLEY.—February 28th.—For the supply of broken granite, limestone, macadam, shovels, spades, brushes, earthenware pipes, flags, kerbs, channels, grit setts, cast-iron gully grates, and manhole covers, for the rural district council.—Mr. H. Pritchard, surveyor, 18 Nicholas-street, Burnley.

EXETER.—February 28th.—For the construction of 1,000 super. yards of pitch grout macadam road, for the corporation.—Mr. T. Moulding, city engineer and surveyor, Exeter.

EASINGTON.—February 28th.—For making up and paving with slag certain private roads for the rural district council.—Mr. J. G. Heslop, highway surveyor, Castle Eden, Durham.

LONDON.—March 1st.—For the supply of Channel Island granite, Channel Island granite siftings, Farnham gravel, Kentish flints, cockle-shells, red pit sand, screened Thames sand, and Kentish rag, for the Commissioners of Works. The secretary, H.M. Office of Works, Storey's-gate, London, S.W.

WARDLE.—March 1st.—For the supply of granite macadam, tar macadam, flags, setts, kerbs, sanitary pipes, brushes, and team labour, for the urban district council.—Mr. J. D. Hurst, clerk, Council Offices, Wardle, Lancs.

SADDLEWORTH.—March 1st.—For the supply of granite, limestone, limestone chippings, granite chippings, dross, dross chippings, and tar macadam, for the urban district council.—Mr. E. Rowbotham, clerk.

HARDINGSTONE. March 2nd.—For the supply of Hartshill, Groby, Tuttle-hill, Mountsorrel, and other granite and chippings, for the rural district council. Mr. J. R. Phillips, clerk, 2, St. Giles-square, Northampton.

DORCHESTER.—March 2nd.—For the repair of the district roads for one year, for the rural district council.—Mr. J. J. Estridge, highway surveyor, Bleak House, Maumbury Way, Dorchester.

BEDWAS AND MACHEN. March 2nd.—For the supply of ballast, metalling, and lamp oil, for the urban district council.—Mr. A. S. V. Taylor, Council Offices, Bedwas.

CHESTERTON.—March 3rd.—For the supply of about 5,000 tons of broken granite, for the rural district council.—Mr. J. Dunn, surveyor, Brunswick House, Cambridge.

DRIFFIELD.—March 3rd.—For the supply of 6,500 tons of whinstone and granite, 2,000 tons of broken slag, 500 tons of sea cobbles, and 300 tons of sea gravel for the rural district council.—Mr. T. C. Beaumont, surveyor, Driffield.

DURHAM.—March 3rd.—Tenders are invited for a second-hand No. 1 Smith hot-mixer plant for the making of tar-macadam. Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

SIBSEY. March 3rd. For the supply of granite, slag, slag dust and chips, for the rural district council.—Mr. J. M. Simpson, clerk, 28 Wide Bargate, Boston, Lincs.

SOUTHWELL. March 5th. For the supply of road materials, for the rural district council.—Mr. J. Ellis, clerk, Southwell.

HUNSLET.—March 5th.—For the supply of highway material, for the rural district council.—Mr. W. B. Pindar, clerk, Leak-street, Hunslet, Leeds.

LOUGHBOROUGH.—March 5th.—For the supply of broken granite, for the corporation.—Mr. A. H. Walker, borough surveyor, Town Hall, Loughborough.

NEWMARKET.—March 5th.—For the supply of 3,000 tons of 2½-in. best broken Leicestershire granite, 3,750 tons of 1½-in., and 170 tons of granite chippings, for the rural district council.—Mr. F. J. Blackbourn, acting clerk, Deva-chambers, Newmarket.

HORNCASTLE.—March 5th.—For the supply of 260 tons of X granite, 300 tons of XX granite, 150 tons of X slag, and 70 tons of slag or granite chips, for the urban district council.—The acting surveyor, Court House, Horncastle.

SUNBURY-ON-THAMES.—March 5th.—For the supply of 500 tons of Guernsey, Clee Hill, Burdon Hill, or Charnwood granite, and 300 tons of slag tar macadam, for the urban district council.—Mr. H. F. Coales, surveyor, Council Offices.

WEST SUFFOLK.—March 6th.—For the supply of broken material (tarred and untarred), for the county council.—Mr. T. W. Morgan, acting county surveyor, Shire Hall, Bury St. Edmunds.

BLYTHING.—March 7th.—For the supply of 5,500 tons of granite, granite chips and flints, for the rural district council.—Mr. H. A. Mullens, clerk, Council Offices, Bulcamp, Halesworth.

STROOD.—March 7th.—For the supply of Guernsey granite spalls, broken Guernsey and other granites, quartzite, and basalt, Kentish rag, surface-picked and grubbed flints, local pit flints, and dehydrated tar, for the rural district council.—Mr. J. E. Povey, clerk, Council Offices, Stroud.

DURHAM.—March 10th.—For the supply of broken whinstone, broken limestone, broken slag, rough slag, tarred slag, tarred limestone, distilled and prepared tar, tools, team labour, cartage, and sanitary pipes, for the county council.—Mr. A. E. Brookes, county surveyor, Shire Hall, Durham.

SHEPTON MALLET. March 10th. For cleansing the highways, street watering, steam rolling and scarifying, and the supply of road materials, for the urban district council.—The Acting Surveyor, Council Offices.

BUCKLOW.—March 12th.—For the supply of granite setts, grit setts, broken granite and slag, chippings, cinders, road grids, tools, and paving, for the rural district council.—Mr. R. Curtis Corden, highway surveyor, Knutsford, Cheshire.

LEAMINGTON.—March 12th.—For the supply of about 2,500 tons of road stone, for the corporation. The road surveyor, Adelaide-road Depot, Leamington.

WALSALL.—March 13th.—For the supply of broken furnace slag, broken granite, and stoneware pipes, for the rural district council.—Mr. W. P. Young, district surveyor, Council Offices, Daw End, Rushall, Walsall.

ST. HELENS.—March 17th.—For the supply of macadam, granite chippings, limestone chippings, granite setts, kerbs, channels, grit setts, concrete flags, sand and tarred macadam, for the corporation. —Borough Engineer, Town Hall, St. Helens.

KIVETON PARK. March 17th.—For the supply of broken slag, granite, and tar macadam, for the rural district council.—Mr. F. Hewitt, surveyor, council offices, Kiveton Park Station, near Sheffield.

EPSOM.—March 19th.—For the supply of granite chippings, dug flints, fine gravel, sand, stoneware pipes, and team labour, for the rural district council. —Mr. T. E. Ware, surveyor, Waterloo-road, Epsom.

CHAILEY.—March 22nd.—For the supply of about 2,980 yds. of flints, 2,550 yds. of granite or other stone, and 60 yds. of gravel, for the rural district council.—Mr. C. Patrick, clerk, Union Offices, West-street, Lewes.

GAINSBOROUGH.—For the supply of between 7,000 and 8,000 tons of whinstone and about 500 tons of slag, for the rural district council.—Mr. R. Maxwell, surveyor, Lea-road, Gainsborough.

EAST ELLOE.—For the supply of granite slag and gravel, for the rural district council.—Mr. S. S Mossop, clerk, West End, Holbeach.

Sanitary.

WAKEFIELD. — February 26th.—For work of public scavenging, for the rural district council.—Mr. W. Druce, clerk, Tetley House, Wakefield.

SMALLTHORNE.—February 28th.—For scavenging the Packmoor area, for the urban district council.—The Sanitary Inspector, Smallthorne, Staffs.

BARNSLEY.—March 1st.—For scavenging and bell cart work, for the rural district council.—Mr. D. Thompson, sanitary inspector, 17 Regent-street, Barnsley.

REPTON.—March 1st.—For emptying dustpits and closets, for the rural district council.—Mr. C. F. Chamberlain, clerk, Union Offices, Burton-on-Trent.

BARNSLEY.—March 1st.—For scavenging the parish of Carlton, for the rural district council.—Mr. D. Thompson, sanitary inspector, 17, Regent-street, Barnsley.

LLANDAFF.—March 1st.—For the construction of 400 yds. of 9-in. and 18-in. earthenware and cast-iron pipe sewers, with manholes, for the rural district council.—Mr. J. Holden, engineer, Park House, 20 Park-place, Cardiff.

GAINSBOROUGH.—March 3rd.—For the supply of stoneware and earthenware pipes, gullies and cast-iron pipes, for the urban district council.—Mr. S. W. Parker, engineer and surveyor, 6 Lord-street, Gainsborough.

NEWCASTLE-ON-TYNE.—March 5th.—For the removal of house refuse, for the corporation.—Acting City Engineer, Town Hall.

BEDLINGTON.—March 5th.—For the removal of the contents of privies and ashpits, for the urban district council.—Mr. J. E. Johnston, surveyor, Council Offices.

LLANDAFF AND DINAS POWIS.—March 7th.—For horsing scavenging wagons and removing house refuse, for the rural district council.—Mr. M. Warren, clerk, Park House, 20, Park-place, Cardiff.

HOWDEN.—March 8th.—For scavenging, for the rural district council.—Mr. H. Green, clerk, Howden.

WEST HAM.—March 8th.—For the supply of disinfectants, for the Education Committee.—Town Clerk, 95, The Grove, Stratford.

ALNWICK. March 12th. For cleansing ashpits and carting ash-box refuse, for the rural district council. Mr. H. W. Watson, clerk.

CAERPHILLY. March 20th. For scavenging in various districts, for the urban district council.—Mr. T. H. Richards, surveyor.

Stores.

MALDEN AND COOMBE.—February 26th. For the supply of bricks, flints, granite, fine gravel, tar-macadam, tar paving, Portland cement, brooms, brushes, manhole covers, gully gratings, pitch, creosote oil, distilled tar, paints, colours, leads, varnishes, oils and stoneware, for the urban district council. Mr. James W. Johnson, clerk, Council Offices, New Malden, Surrey.

WHITEFIELD.—February 26th.—For the supply of granite macadam, setts, chippings, kerbs, flags, disinfectants, earthenware pipes, and ironwork, for the urban district council.—Mr. G. M. Denton, engineer and surveyor, Whitefield.

EXETER.—March 1st.—For the supply of bricks, cast blocks and existing stocks of sweeping machines, Portland cement, building lime and slates, cast-iron pipes, granite channelling, kerb and setts, Yorkshire flags, concrete flags, painting and paperhangers' work, stoneware pipes, miscellaneous iron castings, slate and sand, timber (foreign and English), ironmongery, oils, plumbers' materials and labour, asbestos goods, and manure or baskets, for the corporation.—Mr. Thomas Moulding, city engineer and surveyor, Municipal Offices, Exeter.

SURBITON.—March 1st.—For the supply of material and execution of various works during the year 1917-18.—Mr. F. W. Wood, clerk to the urban district council.

CLITHEROE.—March 3rd.—For the supply of wrought iron, steam tubes and fittings, ironmongery, lime, team labour, disinfectants, limestone, earthenware pipes, street gates, brushes, mortar, granite, flags, setts, pitch, and oil, for the corporation. The Borough Surveyor.

CHARDLE.—March 3rd.—For the supply of labour on highways, granite and other tar-macadam, broken granite for macadam, artificial stone flags, kerbs, setts, flags, earthenware pipes and other earthenware materials, Portland cement, disinfectants and oils, for the urban district council.—Mr. F. D. Barton, acting surveyor.

SOUTH SHIELDS.—March 3rd.—For the supply of Northumberland whinstone, Frieshire whinstone, Aberdeen and Norwegian granite, slag, granite chippings, Caithness flags, Portland cement, cement concrete flags, cast ironwork, shovels, scavenger brooms and machine brooms, coal, coke, disinfectants, leather hose, sewer boots, jackets, sanitary pipes, paints, paint oils, glass, timber, iron, horseshoe nails, cart axles, springs, tar, pitch, oils, and general stores for the corporation. The Borough Engineer, Municipal Buildings, South Shields.

BIDDULPH.—March 5th.—For the supply of 2,400 tons of coal, 120 tons of white lime, limestone for chilling and gravel, and basalt metalling and gravel, for the urban district council.—Mr. Dan H. Price, engineer and surveyor, Aberbargoed.

COLCHESTER.—March 7th.—For the supply of Derbyshire stone, lime, granite kerbing, granite setts, broken granite, Kettering iron slag, tar-macadam, tucker, kentish ragstone, Kentish sifted red flints, Portland cement, glazed stoneware sewer pipes, junctions, bends, traps, taper pipes and gratings for the corporation.—Mr. H. Collins, borough engineer and surveyor, Town Hall, Colchester.

EAST HAM.—March 9th.—For the supply of glazed stoneware pipes, glazed stoneware gully fitting, Lincoln pressed and other bricks, Thames-ballast, coal and coke, broken granite, crushed granite, granite setts, Guernsey and other granite chipping, granite kerb and channelling, broken flint, cast iron gully gratings, shovels, brooms, picks and barrows, disinfectants, oilskins, hire of horses and carts, costume of jeans, uniforms, sewer ventilating [illegible] smocks, veterinary attendance, provender, [illegible] and repair of street lamps, [illegible] removal of tinware from [illegible] and refreshing of setts, for the corporation.—Mr. C. L. Pace Wilson, town clerk, Town Hall, East Ham, E.

BUXTON.—March 10th.—For the supply of paving setts, flag setts, Derbyshire basalt macadam, tarred limestone chippings and lump lime, Portland cement, earthenware pipes, disinfectants, castings, cast ironwork, shovels, picks, ironmongery, [illegible] pitch and refined tar, for the corporation.—Mr. E. F. Deville, borough engineer, Town Hall, Buxton.

DURHAM.—March 10th.—For the supply of broken whinstone, broken limestone, broken slag, rough slag, tarred slag, tarred limestone, distilled and prepared tar, tools, team labour and cartage, and sanitary pipes, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

DERBY.—March 12th.—For the supply of bricks, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar and slag, for the corporation.—Mr. John Ward, borough surveyor, Babington-lane, Derby.

HEYWOOD.—March 17th.—For the supply of setts, kerbs (local stone), flags (local stone), earthenware pipes, bends, junctions, taper pipes, traps, gullies, pitch, creosote oil, limestone chippings (white), hand-broken granite and granite chippings, and Portland cement (British standard specification), for the corporation.—Mr. J. B. Nuttall, borough surveyor, Municipal Offices, Heywood.

Miscellaneous.

BATTERSEA.—March 5th.—For the supply of good, strong, well-conditioned cart horses, from the 31st March next, the council to stable, shoe, and keep the horses, for the borough council.—Mr. W. Marcus Wilkins, town clerk, Town Hall, Battersea, S.W.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* **Accepted.** † **Recommended for acceptance.**

LONDON.—In each of the following cases the first-named tender has been accepted by the London County Council Main Drainage Committee.

North Woolwich Pumping Station: Supply of Pump Grids and Valves.—Seagers, Limited, Dartford, £75; J. Cochrane, Barrhead, £92; Clayton, Goodfellow & Co., Limited, Blackburn, £95; Hathorn, Davey & Co., Limited, Leeds, £134.

Rising Main at North Woolwich: Supply of Pipes for Repair.—Holwell Iron Company, Limited, Melton Mowbray, £8 10s. a ton (carriage extra); Stanton Ironworks Company, Limited, Nottingham, £8 15s.; Staveley Coal and Iron Company, Limited, Chesterfield, £8 15s.

North Woolwich Pumping Station: Sale of Scrap Iron.—C. A. Robinson & Co., East Greenwich, S.E., £3 5s. a ton; T. W. Ward, Limited, Silvertown, E., £3; G. Cohen, Sons & Co., Commercial-road East, E., £2 17s. 6d.; E. J. Webster, Marshgate-lane, E. (for cast scrap), £2 17s. 6d.; (for burnt scrap), £2.

Southern Outfall: Removal of Screen Refuse.—J. Gittings, Plumstead, S.E., 1s. a ton; F. and P. Showler, Abbey Wood, 1s. 6d.

Southern Outfall: Supply of Bolts and Washer-plates for Repairs to Pier.—F. W. Cotterill, Limited, Darlaston, £42 16s.; Wilkes, Limited, Darlaston, £39; Bayliss, Jones & Bayliss, Limited, Wolverhampton (not to specification), £31 5s. (less 2½ per cent).

North Woolwich Pumping Station: Supply of Steelwork for Pump Platform in Silt Pits.—Measures Brothers, Limited, Southwark, S.E., £28 19s. 6d.; H. Young & Co., Vauxhall-cross, S.E., £39 10s.; Flavell & Churchill, East Greenwich, S.E., £41 10s.

SUNBURY-ON-THAMES.—For the supply of about 10,000 gallons of refined tar, for the urban district council.—Mr. H. F. Coales, surveyor.

	Per gallon.
Grindley & Co., Limited, London, E.	5d.
R. S. Clare & Co., Limited, Liverpool	4 5/16d.
Road Supply Company, London, S.W.	3 9/10d.
E. Catchpole & Sons (London), Limited, London, S.E.	3⅝d.
Gas Light and Coke Company, London, E.C.	3⅜d.
Forbes, Abbott & Leonard, Limited, London, E.C.	3⅜d.
F. G. Holmes & Co., Northfleet	3⅜d.
Robinson Brothers, Limited, Birmingham	3⅜d.
T. Clayton (Oldbury), Limited, Brentford	3⅜d.

TRING.—Accepted for the supply of blast-furnace slag, granite chippings, refined tar, flints, and hoggin, for the urban district council.—Mr. S. S. Gettings, surveyor.

Holwell Iron Company, Limited, Asfordby.—2-in. slag, 8s. 10d. per ton; 1-in. slag, 8s. 7d.; slag chippings, 9s. 1d.

Boyce & Son, Paddington.—River flints, 5s. 6d. per ton.

Kempson & Co., Limited, Alfreton.—Refined tar, 3⅜d. per gallon.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY.

24. Institution of Municipal and County Engineers.—South Wales District Meeting at Neath.

MARCH.

24. Town Planning Institute.—Mr. W. Rees Jeffreys on "Road Construction and Improvements by Means of Town Planning Schemes." 6 p.m.

31. Institution of Municipal and County Engineers.—North-Eastern District Meeting at Spennborough.

APRIL.

7. Institution of Municipal and County Engineers.—Eastern Sub-District (Suffolk, Norfolk, and Cambridge) Meeting at Beccles.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

REQUIRED, an experienced fully qualified Engineer, capable of supervising and carrying through road making, surveying estates' water supplies, dramage, buildings, transport arrangements, erection of machinery, and all engineering, surveying and constructional work required in the development of large rubber estates in the Malay Peninsula. Good salary and generous treatment will be given to a really capable, first-class man whose knowledge, experience and ability would fit him for such a post. Apply, in first instance, with full particulars, in strictest confidence, to Box No. 7,996, c/o A. J. Wilson and Co., Ltd., 154, Clerkenwell-road, London, E.C. (3,301)

CITY OF SALISBURY.
CITY SURVEYOR'S TEMPORARY ASSISTANT.

The Town Council invite applications from men ineligible for military service for the appointment of a Temporary Assistant in the Office of their City Engineer and Surveyor, in consequence of the absence of the present Assistant on Active Service.

Applicants must have had experience in a Municipal Engineer's Office.

The appointment to be determinable by a month's notice.

Applications, in candidate's own handwriting, stating age, experience, salary required (the salary previously paid to the Temporary Assistant being at the rate of £104 per annum), when able to commence duties, and accompanied by copies of not more than three recent testimonials, to be sent immediately to the City Engineer and Surveyor, Salisbury.

FRANCIS HODDING,
Town Clerk.

Municipal Offices,
Salisbury.
February 20, 1917. (3,316)

MISCELLANEOUS.

WANTED to Purchase, 2 New or Second-hand Water Carts for Street Watering. Capacity about 250 gallons. Full particulars and price should be sent to Surveyor, Court House, Horncastle, before Monday, 5th March prox. (3,319)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

CITY AND COUNTY OF THE CITY OF EXETER.

The Exeter City Council invite Tenders for the Supply and Delivery of the following Goods for a period of one year, ending 31st March, 1918.—

1. Bricks.
2. Bass Brooms and refilling stocks of sweeping machines.
3. Portland Cement.
4. Building Lime and Slates.
5. Cast-iron Pipes.
6. Granite Channelling, Kerb and Setts.
7. Yorkstone Flags.
8. Concrete Flags.
9. Painting and Paperhangers' Work.
10. Stoneware Pipes.
11. Miscellaneous Iron Castings.
12. Stone and Sand.
13a. Timber (Foreign).
13b. Timber (English).
14. Ironmongery.
15. Oils.
16. Plumbers' Materials and Labour.
17. Asbestos Goods.
18. Maunds or Baskets.

Printed Schedule, Specification and Form of Tender can be obtained on application to Mr. Thomas Moulding, M.INST.C.E., City Engineer and Surveyor, Municipal Offices, Exeter.

Tenders may be submitted for all or any of the Articles required, and the Council reserve the right to accept a portion of a Tender only.

Sealed priced-out Schedules, endorsed with the heading to which the Tender applies, must be sent to the Town Clerk, Municipal Offices, Exeter, before 10 a.m. on Thursday, the 1st March, 1917.

The lowest or any Tender will not necessarily be accepted.

(3,321) H. LLOYD PARRY, Town Clerk.

CAMBRIDGESHIRE COUNTY COUNCIL.
TENDERS FOR STEAM ROLLING.

The above Council invite Tenders for the Hire of Steam Rollers for use on the main roads during the year ending March 31, 1918.

Particulars and Forms of Tender may be obtained from, and Tenders are to be delivered on or before year ending March 31, 1917, to

H. H. DUNN,
Acting County Surveyor.

County Hall, Cambridge. (3,310)

EAST HAM CORPORATION.
ANNUAL SUPPLIES.

The East Ham Corporation invite Tenders for the after-mentioned Supplies and for executing the following Work, for—

(1) A period of 6 months, ending 30th September, 1917, and alternatively,
(2) A period of 12 months, ending 31st March, 1918:—

Glazed Stoneware Pipes.
Glazed Stoneware Gully Fittings (London Make).
Portland Cement.
Grey Stone, Chalk, and Blue Lias Lime.
Stock and other Bricks, &c.
Thames Ballast, Sand, &c.
Coal and Coke.
Broken Granite.
Crushed Granite.
Granite Setts.
Guernsey and other Granite Chippings.
Granite Kerb and Channelling.
Broken Flints.
Cast-iron Work, Gullies, &c.
Shovels, Brooms, Picks and Handles.
Disinfectants.
Oilskins.
Hire of Horses and Carts for Watering Streets.
Hire of Horses and Carts for General Cartages.
Hire of Horses and Carts for Scavenging.
Hire of Horses and Carts for Collection of House Refuse.
Cartage of Lime.
Uniforms for Firemen, &c.
Uniforms for Tramway Employees.
Sewer Ventilating Columns.
Boots, Sewer Smocks, &c.
Veterinary Attendance on and Shoeing Horses.
Provender.
Reglazing and Repair of Street Lamps.
Creosoted Deal Wood Blocks.
Removal of Tinware from Destructor Works.
Redressing of Setts (Labour only).

Particulars and Forms of Tender may be obtained upon application at the Offices of the undersigned, or by forwarding an addressed envelope (foolscap size), duly stamped.

The person or persons whose Tender is accepted will be required to observe and fulfil the obligations upon Contractors specified in the Fair Wages Resolution adopted by the House of Commons on the 10th March, 1909, which is fully set forth in the Form of Tender, and to enter into a Contract with a Bond for the due performance thereof.

Tenders to be delivered addressed to His Worship the Mayor, Town Hall, East Ham, E., and endorsed according to the supply or work tendered for, not later than 12 o'clock noon of Friday, 9th March, 1917.

The Corporation does not bind itself to accept the lowest or any Tender.

(By order)
EUSTACE WILSON,
Town Clerk.

Town Hall,
East Ham, E.
February 21, 1917. (3,320)

DURHAM COUNTY COUNCIL.

AUCKLAND AND CHESTER MAIN ROAD DISTRICT.

TENDERS FOR MATERIALS

The Works Committee invite Tenders for the Supply of the undermentioned Materials, Stores, Steam, Rolling and Tractor Hire, &c., for the year ending 31st March, 1918:—

(1) Broken Whinstone
(2) " Limestone
(3) " Slag
(4) Rough Slag
(5) Tarred Slag and Tarred Limestone
(6) Distilled and Prepared Tar.
(7) Tools.
(8) Team Labour and Cartage.
(9) Sanitary Pipes.

Tenders are invited for the Hire of Steam Rollers and Steam Tractor Hauling Plants for use in the County where the roads are directly maintained by the County Council.

Specifications and Form of Tender for any of the above may be obtained on application to the undersigned, to whom sealed Tenders, suitably endorsed, are to be delivered on or before March 10th, 1917.

The Council do not bind themselves to accept the lowest or any Tender.

ALBERT E. BROOKES,
County Surveyor.

Shire Hall, Durham.
19th February, 1917. (3,302)

CHESTERTON RURAL DISTRICT COUNCIL.

CONTRACTS FOR GRANITE.

The Council will, at their meeting to be held at the Board Room, at Chesterton, on Thursday, the 8th day of March next, receive Tenders for about 5,000 tons of Broken Granite.

Persons willing to Contract are requested to send their Tenders (sealed up) to my Office before 6 o'clock p.m. on Saturday, the 3rd March next.

The Council do not bind themselves to accept the lowest or any Tender.

Forms of Tender may be had upon application to the Surveyor, Mr. J. Dunn, Brunswick House, Cambridge.

No Samples to be sent.

(By order)
JOHN F. SYMONDS,
Clerk.

9 Benet-street,
Cambridge.
February 20, 1917. (3,317)

URBAN DISTRICT COUNCIL OF HORNCASTLE.

ROAD MATERIAL.

The above Council invite Tenders for Supplying the following Road Material, viz.:—

260 tons (more or less) of X Granite.
300 tons (more or less) of XX Granite.
150 tons (more or less) of X Slag.
70 tons (more or less) of Slag or Granite Chips.

To be delivered at Horncastle Station as and when required by the Council's Surveyor (the Contract to be completed by 31st October next, and security for the due performance thereof must be given).

Small Samples to be sent to the Acting Surveyor, Court House, Horncastle.

Forms of Tender can be obtained from the undersigned.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, marked "Road Material," must be delivered to me not later than 2 p.m. on Monday, 5th March prox.

(By order)
R. W. CLITHEROW,
Clerk to the Council.

Court House, Horncastle.
February 20, 1917. (3,318)

ROAD MAKING.

REINFORCE CONCRETE ROADS WITH
EXPANDED METAL.

EXMOUTH ESPLANADE WORKS. Expanded Steel Concrete Slope and Roadway. Length 1 mile. Total width of Roadway, 65 feet. Mr. SAMUEL HOUSE, Urban District Council Engineer and Surveyor.

THE EXPANDED METAL COMPANY, LIMITED
(Patentees and Manufacturers of Expanded Metal).
Head Office: YORK MANSION, YORK STREET, WESTMINSTER, LONDON, S.W.
Works: STRANTON WORKS, WEST HARTLEPOOL.

The Surveyor

And Municipal and County Engineer.

Vol. LI. MARCH 2, 1917. No. 1,311.

Minutes of Proceedings.

State Canals. The announcement that an Executive Committee, with Sir Maurice Fitzmaurice as chairman, has been appointed to control the canals which are required for essential traffic is of considerable interest. The causes which have led to the canal system of this country falling into comparative disuse are various. As to the fact, however, there can be no doubt. When the canal system was originally instituted great hopes were held of its successful development. The origin of the canal system lay in the bad condition of the old highways of the country, which constituted the sole means of transport for commerce in the early days. They were made with a distinct view to economy in initial outlay, and without any real foresight as to the ultimate demands of the country, the commercial development of which was at that time proceeding with extraordinary rapidity. Two factors in the main led to arrest their development. In the first place there was the great work of Macadam, in connection with improvements in road construction, and in the second place there was the advent of railways. As originally designed, the canals were intended to meet local needs rather than to provide facilities for long-distance traffic. The consequence was that they were made of narrow width, and in a manner totally inadequate to meet the demands which the rapidly increasing commercial prosperity of the country might place upon them. In spite, however, of all the neglect and discouragement from which they have suffered, they are still able to deal annually with over 10,000,000 tons of traffic, producing a revenue of considerably over £2,500,000. The extraordinary pressure put upon the railways in consequence of the war has forced to the front the problem of canal improvement, which, even in the pre-war period, was of pressing national importance. There can be no doubt that, even with all the limitations of our existing canal system, it can be rendered much more effective to national purposes by organised control, and it is for this purpose that Sir Maurice Fitzmaurice's committee has been appointed.

Chief among the difficulties in using the canals for national traffic are the large number of locks, necessitated by differences in level, and the number of tunnels, which had to be provided owing to the same cause. Systematic widening and improvement would be an enormously costly business, and would occupy far too much time to be adopted as a war emergency measure. The immediate problem is rather to devise some means for utilising to the best advantage the canals as they exist. The Order appointing the committee deals in terms only with canals other than those owned by railways. We are not clear as to whether this includes those canals which, though not owned by railway companies, are controlled by them. With the development of the railway system a desire naturally arose on the part of the railway companies to do away with the competition of canals, and for this purpose they have obtained control of many canals usually by means of an agreement providing for a guaranteed dividend to the canal companies. It is obvious that this device results in a slackening of effort on the part of the canal companies to make the best use of their undertakings, and, indeed, this was the avowed object of many of the agreements. While therefore we are uncertain as to whether these canals will come under the jurisdiction of the committee, we hope in the national interest that this is the case. Be this as it may, the appointment of the committee, like the temporary nationalisation of the railway systems, will probably have consequences of a permanent nature, and will not be limited in its effect to the period of war.

* * *

Officials after the War. Among the many services that have been rendered to the general body of local government officials by Sir Homewood Crawford, the City solicitor, not the least is the appointment—for which he was responsible—of the committee to consider the effect of the war upon local government officials generally. It may be within the recollection of our readers that in December last Sir Homewood convened a conference to consider this important subject. The services that have been rendered to the country in these critical times by local government officials both in the field and at home are well known, and the primary object of the conference was to make suggestions for securing that those who have left their appointments temporarily shall in no way be prejudiced by the fact of their having answered readily the call of duty. As a result of the first meeting of the conference, a sub-committee was appointed to consider the views expressed and to report. A few days ago a second conference met, and considered the report of the committee. A number of resolutions were passed, and, generally, there can be little doubt that they will meet with the approval of all local government officials. The

first of the resolutions is probably also the most important. It was to the effect that it is of the utmost importance that all local government officials who have been absent on duty in his Majesty's Forces shall be reinstated in the employment which they previously held, with any promotion and increase of salary to which they would have been entitled if they had stayed in their civil employment, and that no temporary substitutes should be permitted to exclude or take precedence over them. Most local authorities have already provided, in part at all events, for carrying out the terms of this resolution. A point of difficulty lies in providing for promotion and increase of salary which would have been earned had the officials concerned stayed at home. It is impossible, of course, in many cases to say what promotion, if any, would have been gained by these men. Nevertheless, if there is present the desire to do justice, we cannot help thinking that justice will be done.

Another difficult question will arise in connection with those officials who have had the misfortune to become wholly or partially incapacitated in consequence of naval or military service. In this connection the conference passed a resolution that suitable provision should be made by the municipal authorities in these cases, and that they should be empowered to pension or supplement the pensions allowed to officers who may suffer such total or partial disablement. The rest of the resolutions were of a more general character, and, so far as officials are concerned, will not, we are sure, form the subject of contention. They dealt with such subjects as the representation of officials in Parliament, security of tenure, and the necessity for supporting generally a representative association such as the National Association of Local Government Officers, which is continually alive to all proposed changes and able to take effective action.

* * *

Traction Engines and the Roads.

The Order which was recently issued by the Local Government Board withdrawing, for the duration of the war, the restrictions prohibiting the use of studs in the driving wheels of locomotives has caused something like consternation in the minds of those directly responsible for highway maintenance. The issue of this Order is only one more instance of the lack of appreciation by the authorities of the importance of maintaining in a state of the highest efficiency the public roads of the country at the present time. Up to the present highway engineers have been struggling against almost insuperable difficulties. Most of their labour has been taken away, and at the same time it has become exceedingly difficult to obtain material. This would not have mattered so much if there had been any corresponding decrease in the traffic. Unfortunately, however, the contrary is the case. Not only do the roads have to bear an enormous amount of military traffic, but also a largely increased volume of heavy commercial traffic, owing to circumstances directly or indirectly connected with the war. The result has already been a most serious depreciation in surfaces of many of the roads in the country. The avowed object of the Order under discussion is to assist farmers in the transport of cattle fodder and other materials. This, of course, is a matter of great importance, but there is another side to the question. For some years past large sums of money have been expended in rendering waterproof the surfaces of roads by the application of bituminous products. The result of allowing heavy traction engines, with studs fitted to their wheels, to pass over these roads will be the puncturing of the surfaces in innumerable places, thus rendering the penetration of water and the destruction of the surface of the roads a matter of certainty. As our correspondent, "A Scottish County Road Surveyor," says in another column, the outlay on road surfaces has to a large extent been met by Government grants derived from the taxation of motors, and undoubtedly this Order of the Local Government Board, if it remains in force, will be the means of undoing this excellent work. It is probably too late for effective action to be taken by any of the professional societies, but in our view they would be well advised at least to lodge some protest and to call the attention of the authorities to what must be the inevitable result of the working of the new Order.

* * *

Glasgow's Successful Tramways.

The congratulatory gathering held in Glasgow last week in connection with the municipal tramways undertaking was noteworthy in several respects. One was the handing by Bailie McNaughton, convener of the Tramways Sub-Committee on Finance, to Treasurer McMillan of a cheque for £2,328,889 for the purpose of wiping out the debt upon the undertaking, thus rendering it free of all liabilities, except that of administration. Even in these days of expansive finance, when money talks to some purpose, this particular cheque will have its own niche in the history of municipal undertakings throughout the world. Yet another regard in which the proceedings were notable was the explanation given of how such a vast sum came to be available for the enfranchisement of the system. How had such a balance been accumulated? The answer, in the matter-of-fact words of Councillor Montgomery, "was very simple." The Tramways Committee from the very beginning had had the ideal before them of giving the best and cheapest service to the community which it was possible to give, and in consequence of that the people of Glasgow had patronised the cars and given the tramways department an extraordinary revenue. The revenue in 1902, when the tramways were first electrified, was £600,000, a very substantial total, as will be allowed. To-day the income has quite doubled that figure, and will this year approach £1,250,000. These moneys were not invested in outside securities. They were sunk in the best of all securities—in the undertaking itself. It was not a rate-aiding enterprise, but one having for its aim the best and cheapest possible facilities of travel. This Glasgow record, unique in so far as results are concerned, will invite comparisons with undertakings in other large cities. It may also invite some criticism, for it is not to be forgotten that it has been erected upon a strictly monopolist system, without the intrusive competition that exists elsewhere. There is no gainsaying, however, that it forms a remarkable achievement as a municipal undertaking, and that, so far as appearances go, it commends itself to the citizens of Glasgow with the prideful feeling of conscious superiority.

* * *

Concrete Roads.

In the last engineering supplement of the *Times*, a letter of considerable interest on the subject of concrete roads appeared over the signature of Mr. W. Matthews Jones, the city surveyor of Chester. Mr. Jones has always been an enthusiast in regard to this matter, and, like everyone who advocates an innovation, he has found himself met with a considerable amount of unreasoning opposition. He now truly points out that, if engineers are afraid to make a beginning with something new, we shall remain without progress year after year. He maintains that, so far as roads are concerned, it is for the highway engineer to devise some method of overcoming the difficulties of the past. On the merits of the

proposal, he points out that one cause of want of success in concrete road construction has been that the engineer has failed to make himself thoroughly conversant with the traffic which uses, and is likely to use, the road when made. It is evident that unless this be done there is the double risk of failure or waste of material. If an engineer designs a bridge he has to take into consideration what the bridge is likely to carry, and he designs it accordingly. So it should be with a reinforced-concrete road. The question is one of great interest, and we are inclined to agree with Mr. Jones that engineers in this country should be afforded some opportunity of studying the matter on the spot, as in America, where this form of construction has been adopted in certain places on a considerable scale. If concrete construction can be made a success, there is no doubt that it is most economical, both as regards first cost and maintenance. If the matter were taken up by engineers, even in an experimental way to start with, it might well be the beginning of a radical reform in road construction methods, which would benefit not only the users of the roads, but also the pockets of the ratepayers.

* * *

National Service. In the last issue of our contemporary the *Referee*, the genial "Dagonet," writing under the heading "Breathings on the Glass," indulged in some reflections on the proposal that every man and woman between the ages of eighteen and sixty-one should perform national service in some form. In this connection he called attention to the fact that during the late snowfall the streets and pavements were in many places left unswept, and made the suggestion that among the occupations for which volunteers might be enrolled should be that of keeping the roads and streets clean. As is usual with "Dagonet," there is much sound sense in this suggestion. The outdoor staffs of most municipalities have been depleted to such an extent by men joining the Colours that it is literally impossible for them to perform their usual duties in an efficient manner. This can be seen not only in the matter of street cleaning, but also in that of refuse removal. In many places it has been found impossible to proceed with the usual periodical removal of house refuse, and in consequence the health of the community, especially in congested neighbourhoods, has been seriously threatened. We were glad to see in our contemporary such sound doctrine set forth as that the health, the comfort, and the safety of a great city are of vital importance even in war time. There can be no doubt that, if the public health services can be kept going in an efficient manner by volunteer workmen, the resulting benefit to the community at large will be very considerable. Probably many inhabitants would go as far as "Dagonet," who says that he is quite prepared to help in the emptying of his own dust-bin if volunteers can be found to remove the refuse in a cart.

* * *

Housing in Huddersfield. It appears from what passed at the last meeting of the Huddersfield Town Council that a serious situation has arisen in the town owing to the fact that various munition firms are pursuing a policy of buying dwelling-houses, giving notice to the tenants, and replacing them by imported munition workers. At the meeting in question a resolution was unanimously carried expressing the great concern with which the local authorities view this action. The situation is particularly serious owing to the fact that, although the Housing Committee are making every effort to meet the shortage of housing accommodation which exists in the town, they cannot get the consent of the authorities to build. It is plain that the action of the munition firms, as stated above, will seriously accentuate the existing shortage. A curious feature of the situation is that at the present time the munition firms who are turning people out of their houses in this way are the only people in the town who have power to build, inasmuch as the hands of the corporation are tied. The existing state of affairs certainly seems to call for some redress, and the strong resolution which was passed unanimously by the council will show that that body is alive to the situation, and it is to be hoped in the public interest that some arrangements may be found possible by which the munition firms in question will provide for housing their workers without disturbing existing tenants.

* * *

Steel in Reinforced Concrete. Since reinforced concrete was introduced into this country it has been customary to employ plain round mild-steel bars, but Mr. Arthur W. C. Shelf, the pioneer of physically developed steel bars for reinforced concrete in this country, in his paper on "High Tensile *versus* Mild Steel for Reinforced Concrete," to be read before the Society of Engineers at Burlington House, Piccadilly, W., on Monday next, will endeavour to prove "that plain mild-steel bars are not the best to employ for this purpose, but that greater efficiency and economy is obtained by physically developing mild-steel bars, for the purpose of taking out the first yield in the steel, which is useless and has a detrimental effect." Mr. Shelf contends that when this first yield or stretch is taken out, a higher yield point is obtained without any injury to the steel, so that it is then safer to employ a 20,000-lb. stress to the square inch (which results in a saving of 20 per cent in weight of steel required) than it is to employ a 16,000-lb. stress to the square inch before the steel is physically developed, and for this reason he considers that the existing regulation of the London County Council relating to the stress on steel should be altered, and thus avoid the cramping of industrial progress.

* * *

A Storm in a Teacup. If we had not by long experience ceased to be surprised at any action on the part of local authorities of a certain kind, we should hardly have believed it possible that such a storm could have been raised over so small a matter as that which took place at a recent meeting of the Newark Rural District Council on an account for £5 for taking a week's census of traffic on the Lincoln road. Owing to the difficulty or impossibility of securing men to do the work (which was undertaken at the request of the Road Board), the surveyor enlisted the services of a troop of Boy Scouts. The gist of the complaint in regard to his action seems to have been, not that the work was done inefficiently, nor, indeed, that the charge was in itself excessive, but that no authority had been obtained in advance for the expenditure. In view of the very small sum involved, the remarks of the chairman were surely a little extravagant. He spoke of the surveyor "running away with the council," and observed that the council could not pay for things unless they gave their sanction. To the outsider it all seems very petty in these days. The Scouts performed an emergency service, and apparently did it very well, and it is now "up to" the council to make a payment to the troop funds accordingly.

The Vesting of Streets in Urban Districts.—In our comments on this subject in our issue of last week, second column, line 20, for "the user of user" read "the area of user."

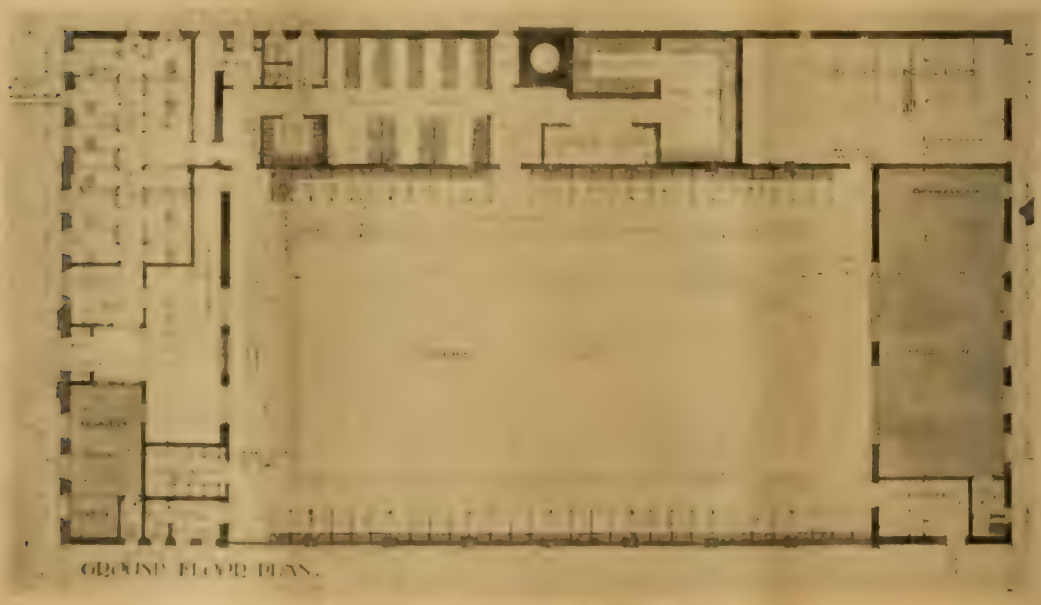
Ferro-Concrete in Swimming Bath Construction.

ITS APPLICATION AT MOTHERWELL.

The comparatively limited extent to which ferro-concrete has been used for swimming baths and ponds is the subject of comment in the February issue of the excellent Mouchel-Hennebique publication, *Ferro-Concrete*. As our contemporary observes, considering the obvious advantages of the material from the structural standpoint, are essentially similar.

A few swimming baths have been executed on the Mouchel-Hennebique system, and have given perfect satisfaction in every way. One of these, completed in 1908 at Northam for the Southampton Corporation,

New Public Baths, Motherwell, N.B.



Motherwell Public Baths—Plan.

for the construction of reservoirs and tanks of all descriptions, it is a little strange that it should not have been employed more widely on work which, was constructed under foundation conditions which rendered the adoption of ordinary concrete impracticable, but involved no difficulty in connection with

ferro-concrete work. There is also a fine ferro-concrete swimming bath at the Y.M.C.A. building in Tottenham Court-road, London.

In Scotland, a ferro-concrete swimming bath 76 ft. long by 36 ft. wide was constructed in the year 1909 for the Dundee Town Council from the designs of the city engineer, Mr. J. Thomson, M.Inst.C.E., and an open-air swimming pond in the same material was constructed at Pollokshaws in 1912 for the town council, the dimensions of this bath being 110 ft. long by 40 ft. wide. A third example has lately been completed at Motherwell, a large and flourishing town of some 50,000 inhabitants, about 12 miles south-east of Glasgow.

Motherwell Public Baths: Interior of Swimming Bath Hall.

Much damage has been caused to buildings in the town by settlements of the surface in consequence of mine workings, a fact which suggests the employment of ferro-concrete in place of ordinary construction. The alternative in question has been adopted with much advantage in Northwich and other places where instability of the soil renders ordinary buildings and other structures particularly liable to damage by subsidence. In view of the local conditions, it will be realised that the employment of Mouchel - Hennebique ferro-concrete was very wisely decided upon by the engineer, and the town council for the construction of the new swimming bath and other important parts of the building in which it was established.

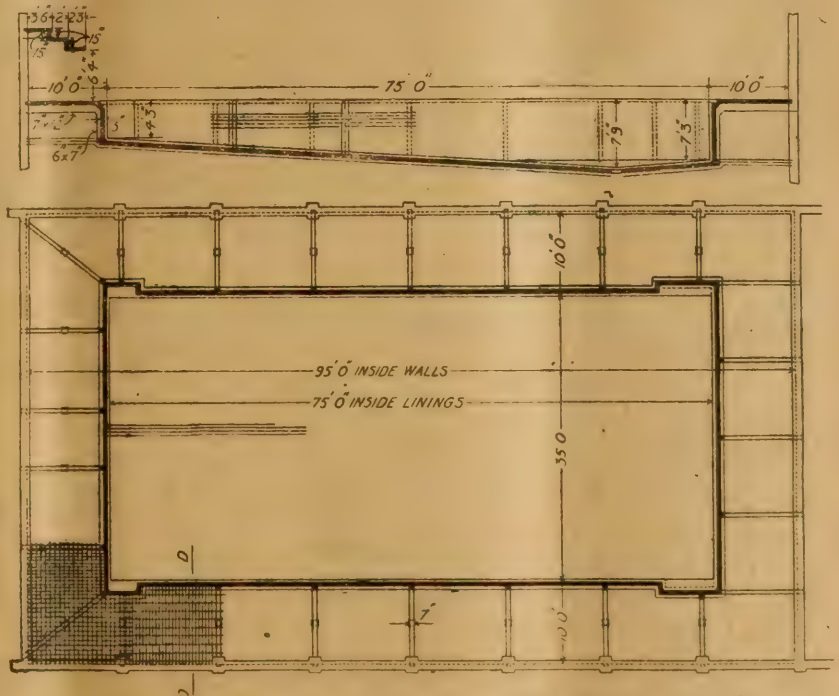
We reproduce a view of the baths from the High-road, the photograph showing the main face and one side of portion in which the swimming bath is accommodated. The scheme, executed under the auspices of the town council, was designed and carried through by Mr. A. Victor Wilson, B.Sc., Assoc.M.Inst.C.E., of Motherwell, at an estimated cost of £10,000, and comprises eleven slipper baths and waiting-rooms in connection, a Turkish bath, and foot baths and sprays for the use of bathers before entering the swimming bath, together with the usual office and lavatory accommodation.

The entrance hall is of commodious dimensions, and opens directly into the swimming bath hall, which is large and well lighted. The interior surfaces of the roofs are enamelled white, giving a particularly bright and inviting appearance to the hall.

The slipper baths are entered from a waiting-room at the left-hand side of the entrance hall, and beyond them is the Turkish bath.

The Turkish bath suite is very complete and self-contained. Close to the entrance are lavatories and boot stores. The two hot rooms and shampooing room are at the further end, the cooling-room and drying-hall being nearer the entrance, and a small Russian bath has been included.

The upper part of the boiler-house extends from the basement into the ground floor beyond the Turkish bath, the basement also containing a steam laundry equipped with modern machinery, store-rooms for coal and other requisites, and a complete range of subways around the lower portion of the swimming bath and beneath the slipper and spray bath departments. The subways around the swimming bath have ferro-concrete



Motherwell Public Baths: Plan and Longitudinal Section of Swimming Bath.

beams supporting the gangways in the same material on the floor above. All the water used in the establishment is filtered in the basement, and the plant is of capacity sufficient for dealing with the entire contents of the swimming bath in less than six hours.

In the large bath hall is the ferro-concrete swim-

ming pond, 75 ft. long by 35 ft. wide by 7 ft. 6 in. deep at one end and 4 ft. 6 in. deep at the other, the maximum depth being 8 ft. 6 in. about 12 ft. from the deep end. The depth of water is 6 ft. 4 in. at the deep end and 3 ft. 3 in. at the shallow end, the bath containing 90,000 gallons of water, maintained at a temperature of 75 deg. Fahr. Ample space has been provided around the bath for circulation and for two ranges of dressing-boxes. The auxiliary appliances

Motherwell Public Baths: View under Gallery.

include a diving-stage, spring board, travelling rings, and special apparatus for swimming instruction.

At the further end of the bath hall there is a gymnasium fitted with the usual appliances for physical exercise.

A special feature of the bath hall is the fine ferro-concrete gallery, so designed that from every part of it a full view of the swimming pond can be obtained.

Opening from the gallery is a club-room for the various clubs desiring to make use of the establishment, the remainder of the upper floor in the front portion of the building being occupied by the residence of the manager.

Ferro-Concrete Construction.

Having given a general description of the new baths, we turn next to details of the ferro-concrete construction, which were prepared from the engineer's drawings by Messrs. L. G. Mouchel & Partners, Limited, of Westminster.

As regards the swimming pond, while the bath itself is 75 ft. long by 35 ft. wide inside the lining, the entire monolithic construction is 95 ft. long by 55 ft. 3 in. wide, comprising the ferro-concrete cantilevers and flooring of the surrounding gangways as well as the bath. The bottom and sides of the bath are 5 in. thick throughout. The beams carrying the gangways are 7 in. wide by 12 in. deep, and are supported at one end by counterforts 7 in. square, projecting from the sides of the bath, the other end being embedded in the walls of the building. Therefore the gangways and one side of the subways around the bath are formed by the ferro-concrete work.

The columns are spaced 12 ft. apart, centre to centre, at a distance of 4 ft. 6 in. away from the main walls of the building, and offer no obstruction along the sides of the bath, as they are on the front line of the dressing-boxes. From each column a short transverse beam is carried back to a corresponding pier on the walls, these beams affording support for the topmost step of the gallery floor. The second step is carried partly by the columns and partly by the above-mentioned beams, and the third step projects in cantilever over the gangway below. This step has a kerb along the outer ledge, and upon it an iron railing is fixed.

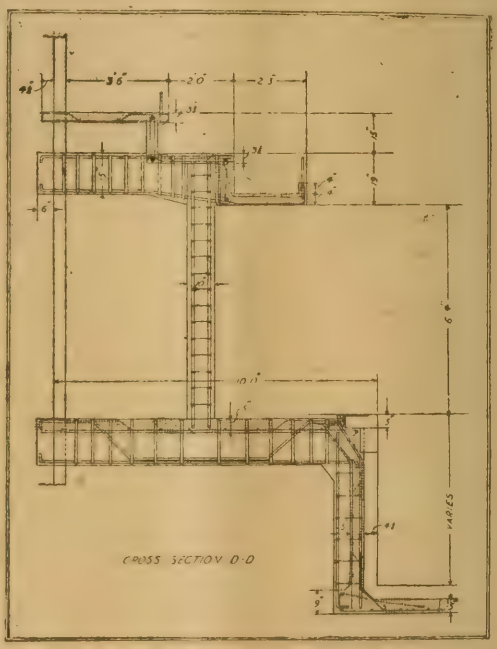
Under one corner of the gallery steps are provided for convenient access to the several tiers of seats. One of the accompanying photographic views shows in the foreground one of the columns, and in the background some of the dressing-boxes between other columns. The upper part represents the under side of the gallery, one of the short transverse beams being seen near the top at the left-hand side. The gallery is 7 ft. 9 in. wide, and designed to carry three tiers of seats for spectators.

In further explanation of the ferro-concrete construction we give a cross-section of the gallery, the drawing also showing part of the swimming-bath wall, one of the beams between the bath and the outer wall and the floor slab of the gangway around the bath.

The whole of the work is in monolithic connection, and reinforced in accordance with the well-known Mouchel-Hennebique standard practice, all the principal reinforcing bars of the various structural elements being securely embedded in the adjoining concrete, and where desirable the ends of the bars are hooked over other bars as an additional anchorage precaution.

The columns are 8 ft. high by 10 in. square, and are reinforced by four longitudinal rods with transverse links at frequent intervals apart. The short transverse beams supported by the columns are 5 in. wide by 15 in. deep for the greater part of their length and deepened down to 18 in. near the columns.

The bottom step of the gallery consists of a longitudinal beam 5 in. wide by 19 in. deep, extending from column to column, and a cantilever slab with an



Motherwell Public Baths: Section of Ferro-Concrete in Gallery.

effective width of 2 ft. The next step is 2 ft. 4 in. wide from front to back, this space being reduced to 2 ft. by the projection of the tier above. The top step is 3 ft. 6 in. wide, and has railings along the front, the space between these and the wall being 3 ft. 3 in., which is sufficient for the seats fixed against the latter.

The ferro-concrete construction was carried out by Mr. John Bertram, of Strathaven, and Messrs. L. G. Mouchel & Partners, Limited, were represented during the execution of the contract by Mr. T. O. Dixon, of Glasgow, their district engineer for Scotland.

Surveyors' Institution.—The next ordinary general meeting will be held in the lecture hall of the institution on Monday, the 12th inst., when the discussion on the paper on the "Defence of the Realm (Acquisition of Land) Act, 1916," read by Mr. Edwin Savill on February 12th, will be resumed. The chair will be taken at 5 o'clock.

Comparative Reports of General Practice.—(LXXXV.).

MOTOR TRACTION FOR MUNICIPAL PURPOSES.

The subjoined return, prepared by the Surveyor, Mr. F. S. R. Carter, was recently presented to the Beddington and Wallington, Surrey, Urban District Council.

Name of authority.	Population.	Area in acres.	Mileage of roads.	Used for	Power adopted.	Description.	Weight.	Capacity c. yards.	No. in use.	Tyres.	Cost.	How purchased.	Wages of driver.	Cost per ton mile.	Cost per week.	Cost of insurance per annum.	Estd. No. of horses s'seded.	Cost of horse, cart, and mann per day.	Are motors more economical and convenient than horses in your district?
Chatham T.C. ..	44,878	4,343	40	General haulage	Steam	Aveling tractor	4t. 15c.	5	2 tractors 6 trucks	Steel	Tractors £550 Trucks £80	Revenue	35 -	—	£3 15 ex. of dep. and reps.	£13	—	12 -	Yes, for certain work.
Chesterfield T.C. ...	40,950	2,643	—	Collection of house refuse	Steam	Clayton steam wagon	—	6½	1	Rubber	£6 3	—	50 -	—	—	£13	6	10/-	No.
Chiswick U.D.C. ...	42,500	1,337	36	Cartage of materials, road watering and house refuse collection	Steam	Yorkshire wagon	4t.	11	2	Rubber	£675	Revenue	37 6	—	—	£13	2½ to 4½	15/-	Yes, for long distances and heavy loads, but not for short distances and light loads.
Denbigh T.C. ..	6,892	9,072	30	Haulage of materials, road watering and flushing of sewers	Steam	Foden wagon	4t. 18c.	6	1	Steel	£610	Revenue by instalments	26 -	—	—	30 -	—	7 6	Yes, especially for long distances.
Ealing T.C.	73,000	2,947	574	Haulage of materials and street watering	Steam	Mann wagon	7t.	5	2	Steel	£655 £621	Do.	34 -	—	£6 inclu.	0 - each	3 to 3½	10 6 increasing	Yes, for picked purposes.
Esher and Dittons U.D.C. ..	13,500	6,000	32	Haulage of materials, &c.	Steam	Mann wagon	5t.	5	1	Steel	£525	Loan seven years	35 - plus bonus	4·20 to 5·78	£7 inclu.	£6 10 0 3rd party only	4	12 -	Undoubtedly.
Heston and Isleworth U.D.C.	50,000	6,893	57	House refuse collection	Electric	Eddison wagon	3t. 17c.	6	1	Rubber	£840	Do.	33 6 & 31 6	—	—	£12	3 to 4	12 -	Yes.
Luton T.C.	60,000	3,132	50	Carting materials	Steam	Aveling tractor	5t.	—	1 & 3 trucks	Steel	£585	Revenue	28/-	4d.	—	£16 15 11	—	12 -	Yes, for haulage of road stone and heavy materials.
Northfleet U.D.C. ...	14,500	3,932	25	Carting materials	Steam	Aveling tractor	5t.	15	1 & 3 trucks	Steel	£678	Loan ten years	34/-	5·86	£6 14 2 inclu.	£17 2 6	4 to 5	13 -	Yes. Saving of £300 per annum.
Rochester T.C. ...	32,000	2,700	26	Haulage	Steam	Aveling tractor	5t.	700 gallon tanks	3	Steel	£450	Revenue	37.6	—	£7 12	£18 10 0 each	—	12 -	Yes.
Richmond T.C. ...	33,223	2,599	45	Haulage, watering and street sweeping	Steam	Yorkshire wagon	6t. 3c.	7 & 1,000 gallon tanks	3	Steel	two £600 one £572	Loan seven years	38 -	—	£6	£8 9 0 for 3	3	11 -	Yes.
Tilbury U.D.C. ...	13,000	1,855	10	Road rolling and haulage	Steam	Aveling tractor and roller	5t.	4½	1 & 2 trucks	Steel	£635	Loan ten years	44 -	—	—	£9 2 6	3	11 -	Yes, considerably so.
Wath upon-Dearne U.D.C.	13,000	2,335	14	Haulage	Steam	Garret superheated wagon	5t.	4½	1	Steel	£525	Loan seven years	35 3	—	£6 8 9	£13 3 0	5	9 -	Not in this district, where journeys are short.

Highways and Byways.*--(2.)

By LAWRENCE W. CHUBB, Secretary to the Commons and Footpaths Preservation Society.

The friction caused by the erection of turnpikes and the imposition of tolls led to much disorder, and culminated in the notorious Rebecca Riots in South Wales. In the meantime, general Acts were passed authorising the punishment by whipping, and, in 1734, even by death of offenders who destroyed gates or toll-houses; but the state of friction continued until Parliament adopted a recommendation of a Select Committee of the House of Commons made in 1864, and finally declined to renew Turnpike Continuance Bills. The Highways and Locomotives Act, 1878, provided that such roads should become main roads, the expense of repair being jointly defrayed by quarter sessions and by grants from the Consolidated Funds. These roads are now under the care of the county councils.

It is greatly to be regretted that, by an obvious oversight, Parliament, when abolishing turnpike trusts, did not take steps to ensure that their records should be handed over to Quarter Sessions. It was enacted that the special powers of the trusts to abate encroachments should be continued; but the plans and records of the trusts which were essential to prove the existence of such encroachments remained with private individuals, to whom they were useless. Such records have a definite historic value, and should be in the keeping of the county authorities. They throw much light upon economic problems of the eighteenth and nineteenth centuries, and are of considerable public interest and utility. County councils should therefore be empowered to acquire these records, on the ground that they concern all the main highways in the country, many of which have been public roads since their construction by the Romans.

CONSOLIDATION OF HIGHWAY ACTS.

Time does not permit me to describe the gradual development of the civic responsibility for the maintenance and preservation of secondary and other highways. On this subject many Acts of Parliament have been passed; indeed, so numerous have these become that authoritative works of reference upon highway laws give extracts from over fifty. A great public service would be rendered if these Acts could be consolidated into one comprehensive Statute.

It may be permissible to express the hope that a group of the barristers who doubtless have recently volunteered for some form of National Service may be deputed to perform this practical and useful task.

ROAD EXPENDITURE.

Few of us perhaps realise the vast expenditure entailed in the upkeep of public roads in England and Wales. For the last normal year before the war it amounted to over £10,500,000—a sum which considerably exceeds the total revenue of Denmark. The burden of repair is increasing rapidly. Since 1907 it has grown by 11½ per cent. The total length of roads repaired by local authorities already amounts to not less than 151,112 miles, and if, and when, the recently proposed schemes of arterial road construction materialise, to meet the growing needs of speedy motor traffic, it is clear that the State will have to bear a considerable share of the financial burden.

PUBLIC RIGHTS.

It is now necessary to invite you to consider what is perhaps the most important and interesting aspect of the subject—the protection of public rights of way from obstruction. We have seen that once a highway has been dedicated to the public it can only be lawfully closed by Act of Parliament or Justices' Order. To obstruct it by any other means is unlawful, for the obstruction of a public way is a nuisance. We are all familiar with the maxim, "Once a highway always a highway," which is based on a decision that no length of time can legalise a public nuisance (*Rex v. Close*, 3 Camp., 227).

Theoretically, therefore, a highway of any kind once created can never be lawfully closed by the irregular action of any individual. This principle has been good in all directions, but prior to the reform of local government effected by the Local Government Acts, 1888 and 1894, the burden of protecting rights of way was not obligatory upon a local authority, but mainly depended upon the voluntary efforts of the village Hampden. The power of the cumulative vote enabled one or two owners to disregard the needs and wishes of the inhabitants of an entire parish in vestry assembled.

For many years the Commons and Footpaths Preservation Society had found it necessary to include in its programme the work of preserving public rights of way, and the National Footpath Preservation Society was formed in 1884 by the late Mr. Henry Allnutt, and did much useful work.

In 1899 the National Footpaths Preservation Society was amalgamated with the Commons Preservation Society, and the work has so grown that, during the last twenty years, nearly 10,000 cases of obstruction of public roads, bridle-ways, and footpaths have been dealt with by the society. Relatively few of these cases have concerned public carriage roads. Those highways are generally repaired at the public expense, and, when that has happened, no question can arise as to the existence of a right of way. Only a small minority of footpaths, however, are repaired by the public, and disputes with regard to them are of frequent occurrence.

It is therefore fortunate that local authorities have far-reaching powers, which, if wisely and fearlessly exercised, render difficult, if not impossible, unlawful attempts to obstruct rights of way. Lord Eversley, the veteran president of the society—the monument of whose fifty-one years of devoted and successful service in fighting the people's battles may be seen in the tens of thousands of acres of common land over which all may wander at will—succeeded in securing the insertion in the Local Government Act, 1894, of a drastic clause with regard to rights of way. This clause (26) declares it to be the duty of district and town councils, as highway authorities, to maintain all public rights of way within their area or in an adjoining district. They were directed to take any steps necessary to that end, including legal proceedings. In rural districts the Act authorised the parish council or parish meeting to put the highway authority in motion, and if it evaded its obligatory duty a power of appeal from the parish to the county council was given. Local councils have therefore ample facilities for vindicating public rights, but in practice it has frequently happened that they have failed to act. The reasons for their inactivity are manifold. Sometimes they fear a lawsuit with its attendant expense, trouble, and uncertainty; or they may be composed of persons who have no sympathy with the public point of view. Again, in an even greater number of cases, they may be influenced by the fact that many of their members work for, or are tenants of, the landowner who is endeavouring to shut up a public path. The power of territorial influence in a country parish is very real. In one typical case in which the Commons and Footpaths Society succeeded in securing and reopening of a public path, the aggressor was not only a magistrate, the patron of the church living, and the lord of the manor, but the chairman of the district and parish councils, and a county councillor as well. Naturally none of those bodies would enforce the law against him; and in this, and in thousands of cases of a similar kind, it has only been the force of popular opinion created, organised, and crystallised into action by the Commons and Footpaths Preservation Society that has led to the vindication of public rights.

RIGHTS OF WAY.

A footpath has many enemies, and it is fortunate that it is a stubborn thing. Its origin may be lost even to tradition, but the path pursues its way with odd twists and turns which now appear meaningless, but which in former days were probably necessary to enable the wayfarer to avoid morasses, ponds, trees, or other natural obstructions which have long since disappeared. The path at one time probably led to a now-forgotten shrine, or chapel, or well, and it certainly came into use to meet a local need. At the moment it may be valued only by ramblers and Nature study enthusiasts, but that affords no reason why it should be arbitrarily closed. The ebb is followed by the flow, and paths which to-day may be

* Paper read before the Royal Society of Arts on the 14th ult.

of little value in the utilitarian sense may to-morrow become of much importance, especially now that the motor car absorbs the country lane as well as the great main roads

When a right of passage over a path which has hitherto been open is challenged, the first step which must be taken is to ascertain and marshal the facts both for and against the popular claim. A public path has certain definite characteristics. As a rule, it is provided with stiles, wicket, or other gates and footbridges; it is often a short cut, and it must be a thoroughfare leading from and to a place where the public have a right to be. Above all, it is desirable to be able to prove that the path has, in fact, been used for a long time as a public way by all who have desired to traverse it. Records, such as tithe or inclosure awards, sale plans, or ancient maps may be available to prove the antiquity of the way, although in view of recent decisions many maps are not admissible as evidence unless the surveyor by whom they were made can be produced to prove them.

PERIOD OF USER.

Unfortunately, up to the present, Parliament has prescribed no fixed period of years of user for establishing a public, as distinguished from a private, right of way. The period varies in accordance with the views of particular judges, and with all the circumstances in connection with the formation, location, and history of the path. In one Metropolitan case (*North London Railway Company* v. *Islington Vestry* (1872), Q.B. 37, J.P. 341), the brief period of eighteen months' user was deemed to be sufficient to support the presumption of dedication. In others, as we shall see, evidence stretching back as far as the oldest men can recollect has been held to be inadequate. It is therefore desirable to aim at securing evidence of forty, or, if possible, of sixty years' duration.

Assuming that inquiry has proved satisfactory upon these points, and that no adverse evidence has come to light, it is fairly safe to conclude that the path in question is, *primâ facie*, a public right of way. But it must not be forgotten that, in the case of most ways which have been challenged, evidence of some sort is also available on the owner's side, and it is of extreme importance that this also should be ascertained. As we have seen, public paths were not created by user. They originated in dedication, and, save in the rare cases where "express" dedication is capable of proof, it is necessary to establish a chain of facts so strongly in favour of the public contention that a judge will hold that the only fair inference or presumption to draw from those facts is that some owner, at some time or another, intended to dedicate a right of way. Such an inference may manifestly be rebutted if the owner can produce evidence of steps taken to protect himself from the presumption of dedication. Sometimes he has erected and maintained notices clearly indicating that persons using the path have done so with his permission; at other times he has closed the path once a year; or again, he may have issued permits for the use of the path. The owner may easily and fully protect himself by steps of this nature from the risk of having a revocable licence transformed into a right against himself.

METHODS OF OBSTRUCTION.

But, as a rule, obstruction, like dedication, is a gradual process, and the form of obstruction most to be feared is of a surreptitious nature which affords an unscrupulous landowner many opportunities for building up a case against the public. His first step will probably be to discourage the use by his own tenants and employees of a path he desires to close. A frequent excuse is that he wishes to establish game preserves and desires privacy. In a country village where the cottages all belong to one owner it is almost impossible for the tenant to ignore the wishes of his landlord. I have known instances in which a man has been summarily ejected from the home of his fathers because his conscience would not permit him to acquiesce in the unjustifiable and unlawful obstruction of a public path. Such landlords are, fortunately, few in number.

Another favourite device is to erect notice-boards warning trespassers or boldly denying the right of way. Sometimes notices are of a more intimidating nature. "Beware of the bull" is often met with, while near Uxbridge a fearsome notice warning pedestrians to "Beware of the Red Bloodhound" may be seen. Close to Croydon, too, there is a wood, happily crossed by several beautiful public paths, where notices warning pedestrians against mantraps and spring guns are still displayed, although the use of such barbarous engines has long been illegal.

ADVICE TO LOCAL AUTHORITIES.

These wooden falsehoods, as they have been aptly described, are difficult to overcome, for, as an eminent judge once said, "A man is entitled to erect on his own land as many lies as he likes, provided they are not libels." The best remedy for this form of attack is to urge the district council to erect finger-posts under the powers conferred upon them by the Highways Act, 1835.

Sometimes, too, the path is obliterated and rendered inconvenient by ploughing. The rule is that a path cannot be lawfully ploughed unless it was originally dedicated subject to the reservation by the owner of the right to plough. Proof of that reservation exists when the path has been regularly ploughed up in the ordinary course of husbandry in the past. (*Harrison* v. *Danby*, 34, J.P. 759.)

Another favourite device is to place barbed wire at the sides of a path in such a manner that pedestrians using the way run the risk of injuring their persons or clothing. If the wire is, in fact, a danger it should be removed as a nuisance at the instance of the highway authority under the Barbed Wire Act, 1893, and damages for injury may be obtained (*Stewart* v. *Wright*, 9 Times L.R. 480.)

Some persons do not hesitate to put bulls or other savage animals in a field through which a public path passes. They have no legal justification for action of this kind, and in one case (*Lowery* v. *Walker*, L.R. 1911, A.C. 10) the House of Lords decided that a man was entitled to damages for injuries inflicted by a horse while he was following a footpath not dedicated as a public right of way, but which was habitually used by the public to the knowledge of the owner as a short cut to the railway station.

Many a path, too, has been gradually lost because the stiles and gates have been allowed to become defective; because footbridges or stepping-stones have disappeared, or because, for lack of a little attention, the tracks have become water-logged or overgrown.

It cannot be denied that a stile perched on the top of a bank may become a serious obstruction when footboards are removed, or when the whole structure decays.

It is, *primâ facie*, the duty of district councils to repair all public highways (including footpaths, but not main roads) known to have been in existence before the Highway Act, 1835, became operative, unless the burden of repair, *ratione tenuræ* or *ratione clausuræ* falls upon the occupier of the land through which such ways pass. The councils can, and should, keep public paths in a reasonable state of repair, and if stiles are allowed to degenerate into such a condition that they are a hindrance to passage they should be dealt with as obstructions. Parish councils, too, are entitled to repair footpaths which are not situate at the sides of public carriage roads, and the Local Government Board have decided that they may also repair stiles and gates, although, in a technical sense, such erections are part of a fence and not of the highway. As to the nature of the repairs the law holds an even balance. The council must not decrease the height of a stile or put a wicket gate in its place if the owner raises objection, because by so doing it would be encouraging a greater number of persons to use the way. On the other hand, the owner must not make a stile less convenient, nor erect one where none previously existed, because if he did so he would be diminishing the public right. In the latter event, too, he might interfere with perambulators, for it has been laid down that the homely perambulator may be wheeled over a footpath, provided it is not of such size and weight as to injure the soil or inconvenience pedestrians, the justification being that a perambulator is a usual accompaniment of a large class of foot-passengers. (*R.* v. *Mathias* (1861), 2 F. and F., 570.)

Field-paths are of so much advantage to the community that it should be the aim of every council to maintain those within their area in a reasonable condition. They must not, without consent, metal a path which has not previously been repaired, or they may find themselves in the unenviable predicament recently experienced by a Berkshire parish council, which was served with a writ by an irate owner because it had innocently ventured to put down a

little stone in holes in a meadow-path, in order to enable the village children to reach their school dry-shod. But they can, in practice, do all that is required to prevent a path from vanishing through disuse.

(To be concluded.)

SPECIFICATIONS FOR CONCRETE ROADS.*

By H Eltinge Breed.

First Deputy Commissioner, New York Commission of Highways.

Cracking of a concrete pavement is due generally to the unequal settlement of a poor subgrade. If the road is to be satisfactory it is of first importance that a good subgrade be secured. These we consider the essentials of a good subgrade:—

(1) It must have uniform bearing power.

If an old road-bed is to be used it must be scarified, re-shaped and re-rolled for the entire width of the pavement, removing all large stone to a depth of 6 in.

(2) It must be dry.

Ditches should be low enough to take away the water from under the pavement. With unstable soil good results can be secured by providing sub-drains and spreading a layer of gravel—preferably run-of-bank gravel—over the subgrade to increase its stability. Material used for this purpose must be impervious; if it is porous it will act during wet periods as a reservoir, which, under conditions of frost, will break the pavement proper.

(3) It should have metal reinforcement (*a*) under very bad—*i.e.*, unequal soil conditions; (*b*) whenever the supporting power of the subgrade changes, as from rock to earth, or passing over a trench.

Our experience indicates that the expense of reinforcement is not justified in gravelly or sandy soils where good natural drainage prevails.

THE MIX.

The mix should be proportioned in such a manner as to give the greatest density. With our requirements for materials we have found that the proportions of 1:1½:3 most nearly do this. Our specifications provide that the concrete shall be mixed in the proportions of 1 volume of cement to 4½ volumes of sand and broken stone or gravel, and the proportions of fine and coarse aggregate are varied slightly as a result of field void tests so that the greatest density is obtained. Should the size or character of the materials change there would be a corresponding change in the proportioning of the mixture.

The coarse aggregate should consist of a well-mixed product of clean No. 1, No. 2 and No. 3 stone or gravel.

No. 1 size is that retained on a ¾-in. circular screen and passing a ¼-in. circular screen.

No. 2 size is that retained on a ¾-in. circular screen and passing a 1½-in. circular screen.

No. 3 size is that retained on a 1½-in. circular screen and passing a 2½-in. circular screen.

It is provided, however, that not more than 25 per cent of the total shall be No. 1 size, the proportions being so graded as to give a minimum of voids.

Aggregates should never be used unless they comply with the tests prescribed.

You may note that we allow, as our maximum size, stone that will pass a 2½-in. ring, whereas most specifications permit only 1½-in. stone as a maximum. This may seem radical, but our reason for the increase in size is that we get equally as good, if not better, results from the larger stone, and at a cost decidedly lessened by our using more nearly the product of the crusher. Especially is the price to be considered on contracts where the local supply is crushed on the ground, as is the case in most of our work. If you have economy, this change is worthy of your consideration. We save 15 per cent in crushing costs by the use of stone larger than the previously accepted standards.

From a practical standpoint, a pile of stone graded from ¾ in. to 2½ in. has more stability when properly mixed than stone graded from ¾ in. to 1½ in. In our tests, and we have used stone up to 2½ in. in size. As an evidence of the comparative strength per square inch of such mixes, tested at an age of twenty-eight days, we have a grand average of 3,370 lb. per square inch for 264 cubes of stone and gravel, of which only 13¾ per cent were under 3,000 lb. Greater density can be obtained by using stone up to 2½ in. in size, and with the larger size stone there is less probability of spalling at joints and along edges.

SAND.

Concrete pavement sand should be such that 100 per cent should pass the ¼-in. screen; not more than 20 per cent should pass a No. 50 sieve, and not more than 6 per cent should pass a No. 100 sieve. However, where more than 20 per cent of the sand passes a No. 50 sieve, where it is well-graded to give a low percentage of voids, and where it conforms to all other requisites, special permission for its use may be given by the chief engineer. Sand may be rejected if it contain more than 5 per cent of loam or silt.

METHOD OF MIXING.

The concrete should be mixed in approved mechanical batch mixers. Mixing should be continued at a speed of not less than 10 revolutions nor more than 16 revolutions per minute, for at least one minute after all materials are in the drum and before any discharge is made.

If at any time during the progress of the work the temperature is so low that in the opinion of the engineer in charge of the work it will within 24 hours drop to 35 deg. Fahr., the water and aggregates should be heated and precautions taken to protect the work from freezing for at least ten days. Should these temperature conditions persist for two consecutive days, permission should be obtained from the chief engineer before proceeding. He will lay down such requirements of procedure as may be permitted. Such procedure should be only for emergency work. In no case should concrete be deposited on a frozen subgrade.

* From a paper read at the annual convention of the American Road Builders' Association.

STREET LIGHTING IN THE METROPOLIS.

NEW METHODS OF OBSCURING.

In the House of Commons on Monday the Home Secretary was asked to explain why the lighting of London had not yet been made uniform in accordance with the orders of the military authorities; whether he was aware that in some boroughs burners were in use consuming 3½ cub. ft. of gas per hour in lamps which were almost completely opaque; and whether he would consider, in order to give a reasonable light and at the same time save gas, if it would be more advantageous for the lower part of the lamp to be clear, but a smaller burner used.

Sir George Cave, in reply, said the alterations in the method of obscuring street lamps were being carried out by the lighting authorities as rapidly as the exigencies of labour would permit, but he was aware that there were some lamps which still remained to be dealt with. A considerable reduction in the consumption of gas had been effected by the use of single burners in multiple-burner lamps and by substituting lower-power burners for those normally used. If the lower part of a lamp were left clear, the result was to throw a disc of light upon the pavement which was visible from above; and he was advised that, taking all things into consideration, the method of obscuring which had been approved was the most satisfactory.

Gas in Sewers.—Following upon a fatal case of asphyxiation by sewer gas, the Main Drainage Committee of the London County Council have authorised measures to be taken when there is reason to suspect the condition of the atmosphere in sewers, and have sanctioned an expenditure of £50 on the purchase of smoke helmets, a hand ventilating fan, and other necessary articles.

Underground Gasholders.—In the course of the last meeting of the Deptford Borough Council a member proposed, "in the interests of health and public safety," that that body should pass a resolution expressing the opinion that all gasometers within one mile of any human habitation should be placed underground, and that the Government should take action to effect the change at an early date. After it had been pointed out to the worthy councillor that in order to put a gasholder underground it might be necessary first to excavate as much as twenty million cubic feet of earth, and the mayor had suggested that the Government should request gas companies to plant poplars round the gasholders and grow climbing roses, the motion was rejected.

Institution of Municipal and County Engineers.

SOUTH WALES DISTRICT MEETING AT NEATH.

A meeting of the South Wales District of the Institution of Municipal and County Engineers was held at Neath on Saturday last, the following being present:—Messrs. J. Richard Heath (Swansea), G. A. Phillips (Glamorgan County), D. M. Jenkins (Neath), D. M. Davies (Neath), A. S. V. Taylor (Bedwas), E. C. Pole (Cardiff), John Morgan (Pontardawe), J. H. Montgomery (Llanelly), F. Hatcher (Porthcawl), and H. Alex. Clarke (Briton Ferry), hon. district secretary.

DISTRICT CHAIRMAN'S ILLNESS.

At the outset of the proceedings the hon. district secretary announced with regret that their esteemed chairman (Mr. W. Harpur, Cardiff) was unable to be present owing to continued ill-health, in consequence of which he asked the meeting not to consider him for re-election to the office of chairman, which he was bound to relinquish.

Mr. D. M. Jenkins was elected chairman *pro tem.*, and proposed a vote of sympathy with Mr. Harpur in his illness, with an expression of hope for a speedy recovery. Mr. Harpur, he said, was one of the most distinguished members of the institution, and the district was honoured to have such a gentleman to preside over its meetings.

Mr. G. A. Phillips seconded the resolution, and Mr. J. R. Heath, in support, remarked that Mr. Harpur's reputation in the Midlands as an engineer was one to be proud of.

Mr. H. Alex. Clarke added that Mr. Harpur had been a friend to him, and he felt his resignation deeply. He proposed that the meeting nominate Mr. D. M. Jenkins borough engineer, Neath, as district chairman.

Mr. G. A. Phillips seconded, and it was unanimously agreed to.

Mr. Jenkins thanked the meeting, and accepted the office on the condition that when Mr. Harpur was restored to health and returned to duties, he (Mr. Jenkins) would immediately vacate the chair for him. Mr. Harpur had set such a high example that it was difficult to follow him. However, he would do his best, and he hoped the year's work would be interesting and productive. Personally, he was a great believer in the educational value of discussions, and he hoped that their meetings in the future would include at least one paper on a topic that was appropriate.

RE-ELECTION OF HON. DISTRICT SECRETARY AND DISTRICT REPRESENTATIVE.

Mr. D. M. Davies proposed the re-election of Mr. H. Alex. Clarke as hon. district secretary.

Mr. John Morgan seconded, and it was unanimously agreed to.

Mr. G. A. Phillips was also re-appointed district representative, on the proposition of the Chairman, seconded by Mr. J. R. Heath.

FUTURE MEETINGS.

The Hon. District Secretary said he had interested himself in the matter of spring and summer meetings, and although the South Wales district was difficult to organise owing chiefly to the isolation of its members, he hoped a special effort would be made to attend the future meetings. He read a letter from Mr. Morley, Tenby, stating that it was his intention of inviting the members to visit his district when the new sewerage scheme was completed, and it was hoped to be able to arrange a meeting in the early summer.

Mr. D. M. Davies invited the members to inspect the Ystradfelte Waterworks in June, and Mr. Fred Hatcher extended a hearty welcome to Porthcawl in July.

Both offers were accepted with thanks.

THE ORPHAN FUND.

The recent proposals of Mr. O. Claude Robson for assisting the Orphan Fund were considered, and the chairman's promise to act as collector for the district was confirmed.

TOWN PLANNING.

In the course of an instructive address on "Town Planning" the Chairman remarked that very few subjects had been so much discussed in recent years, and on the principles involved very little remained to be said. However, a concrete example of the actual steps taken in the initial stage of a scheme might be of service. Neath being one of only four towns in South Wales that had embarked upon town-planning schemes, a statement of the procedure followed, and the experience gained should be of interest and value at a meeting of South Wales municipal engineers.

Sanction had been granted the Neath Corporation by the Local Government Board for the preparation of two schemes. The first dealt with lands within the borough, having a total area of 270 acres. Application was made to the Local Government Board on August 6, 1914, and sanction was given on March 3, 1915. In this scheme no part of the adjoining district of the Neath rural district was included, for the reason that the rural council had determined to prepare a scheme of their own. Owing to pressure of other work, however, the council had not been able to proceed with the work, but a start would be made as soon as circumstances permitted. In regard to the second scheme, for the purpose of developing part of the land within the borough intended to be town-planned, a new road was provisionally laid out, passing through a part of the rural district, wedged in between adjoining parts of the borough. In the circumstances, and in order to save time, it became desirable to take compulsory powers for acquiring the necessary land, and with the approval of the rural council the corporation applied for, and obtained, sanction to prepare a scheme for a small portion of the rural district—an area of 23 acres.

Mr. Jenkins then gave an interesting account of the detailed work done, following seriatim the Amended Procedure Regulations of the Local Government Board issued in February, 1914. These, he said, considerably simplified the procedure laid down in the original regulations, and to a great extent removed the objection urged against them. As a first step, it was obviously necessary that a town-planning committee should be appointed to consider carefully the lands to be comprised in the scheme, and with authority to initiate all preliminary steps. It was decided to include all lands likely to be required for building, open spaces, &c., for a reasonable period in advance. The ordnance survey of the whole borough was brought up to date, and in order to reduce labour, and to provide for other schemes in hand, photo copies were prepared, with the sanction of the Ordnance Survey Department.

Incidentally, he remarked that some objection was raised to the map not consisting of actual ordnance sheets (as provided in the regulations), but the copies were, notwithstanding the objection, accepted. He explained that the map was cut into sections, and mounted on linen in folding form, and encased in a leather thumb case. Extracts were given from the statements and particulars furnished to the Local Government Board, under Article V., and the procedure at the Local Government Board inquiries was detailed. The resolutions adopted were generally in the form of Mr. Aldridge's "Case for Town Planning," which would be found most useful and suggestive. Reference was made to the new municipal housing policy, which included the granting to local authorities of power to purchase land and lease it, under proper safeguards, for building by public utility societies, private builders, &c.

Mr. Jenkins pointed out that there were two principal methods of preparing a town-planning scheme—the one in which all developments were worked out in great detail, with small discretionary powers and little scope for variation subsequently; and the other, in which broad general principles were laid down, with wide discretionary powers. The latter method was generally preferable, but there was no practical difficulty—and in some cases an advantage—to combine both methods in the same scheme. In conclusion, he spoke of the necessity of broadening the scope of town-planning schemes, and the need

of co-ordination in the laying out of new arterial roads through adjoining districts and counties.

Eulogistic references were made to the chairman's instructive, lucid, and entertaining address, and a vote of thanks was accorded him on the proposition of Mr. Heaton seconded by Mr. D. M. Davies.

COUNCIL MEETING.

At the last meeting of the Council of the Institution of Municipal and County Engineers, it was resolved, on the recommendation of the Roads and Tramways Committee, that the secretary be instructed to inform the Local Government Board, in reply to their letter of December 1st, that in the opinion of the council it was very desirable in the public interest that the Local Government Board Emergency Provisions Act should be amended, so as to render costly litigation unnecessary in connection with the matter of routes used for occasional Sunday omnibuses.

NOMINATION OF ORDINARY MEMBERS OF COUNCIL.

It was resolved to nominate the following for election, as ordinary members of council:—Messrs. E. E. W. Butt, G. F. Carter, P. Dodd, E. J. Elford, H. P. Foster, G. Green, W. T. Lancashire, E. B. Martin, F. Massie, T. Moulding, W. H. Prescott, N. Scorgie, C. F. Wike, E. Willis, and E. Worrall.

The secretary reported that the following nominations had been received from members:—Messrs. O. A. Bridges, H. T. Chapman, P. Dodd, G. Green, J. R. Mead, T. Moulding, E. Willis, E. Worrall, of which Messrs. P. Dodd, G. Green, T. Moulding, E. Willis, E. Worrall had already been nominated by the council. To the remaining three names it was resolved to add those of Messrs. A. Gladwell (Eton Rural District Council) and W. R. Hicks (Ealing).

THE ORPHAN FUND.

It was resolved to inform Mr. D. Edwards that a proposition which he had made that contributions should be made to the Orphan Fund from the funds of the institution could not be carried out, as the council had been informed that it would be illegal.

SANITARY SERVICE WORKMEN.

A letter from Mr. J. A. Priestley, with regard to military service and work of cleansing departments and bad time-keeping, was considered, and it was resolved that the council support any action that may result in public sanitary service being placed on the same footing as waterworks, &c.

STREET LIGHTING SPECIFICATION.

Mr. E. J. Elford reported that the delegates appointed to deal with this matter recommend that the council should support the Institution of Electrical Engineers in their proposal to publish a majority report, but that it should be deferred until after the war.

The report was approved and adopted.

Cheap Gas for Heating and Cooking.—The Halifax Corporation Gas Committee are introducing a scheme under which gas consumers in the borough can obtain gas at a cheaper rate for heating and cooking than for lighting purposes.

Waterproof Vaults.—The architect to the Great Northern Railway of Scotland in building the Palace Hotel, Aberdeen, took the precaution of lining the roof of the vaults under the pavement with Pudloed cement, and the result is stated to be most satisfactory. This is worthy of note, as percolation of water in vaults of this description is a difficulty often encountered and one which is liable to cause much expense in repairing.

Profitable Refuse at Birmingham.—The Birmingham city refuse disposal department have been able to make considerable gains by dealing with waste paper and rags which before the war were simply put through the destructor. It now appears that Mr. J. Jackson, the superintendent, has on hand a project, the object of which is to produce from the refuse of local slaughter-houses a food suitable for use in piggeries. Hitherto the refuse consisting of offal, known in the trade as "third, second and third stomachs" has been burned. Another scheme for the collection of food refuse is also engaging attention. It is apparent that large quantities of waste food from the munition canteens and canteen workers' dining-halls might be collected for the feeding of pigs and a plan is under consideration for the collection of this food.

NOTES FROM IRELAND.

Specially Contributed by an Irish Correspondent.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Irish Notes," 24 Bride-lane, Fleet-street, E.C.]

Opportunities for Improvement in Dublin.

The destruction of a large number of the buildings in Sackville-street, Dublin, during the rebellion last year has given the corporation and the owners of property a unique opportunity of widening and improving some of the main thoroughfares leading off it. The most important of these thoroughfares, or, at any rate, the street the widening of which would benefit the general public most largely, is Earl-street. This street runs from Nelson's pillar to Amiens-street Station, the terminus of the Great Northern Railway, and it is also the outlet to Clontarf and a large suburban area on the north-eastern side of Dublin. At present the street is so narrow that there is only room for a single line of tramway down it, but in order to facilitate this traffic there are two or three passing places for cars in the street. When the cars are passing each other at these loops, however, the street is practically blocked to other traffic at these points, and so constant delays are occurring, causing great inconvenience to travellers.

* * * *

During the rebellion a portion of the buildings in the street was demolished, as well as a great part of Sackville-street, and the opportunity now offers of widening the street without much difficulty by 14 ft. at the Sackville-street end. One would suppose that the opportunity of widening would have been eagerly grasped by the corporation and welcomed by the residents of the street. But no; the corporation are divided on the matter, while many of the residents of the street seem opposed to it on the ground that business is better in narrow and congested streets than in wide thoroughfares. Whether the contention is true or not, it seems a very selfish policy to oppose the widening of a leading outlet from the city, particularly when the proposed widening would not be more than sufficient to enable traffic to move freely. If new houses are now built up to the old line of frontage, or nearly up to the line, it will no doubt be generations before the opportunity will occur again of widening the street. In the meantime much of the traffic will probably be diverted to other routes, and the traders in the street will find they have overreached themselves, and that they are losing their trade instead of improving it.

* * * *

Testing Facilities in Ireland.

The writer regrets that he is unable to agree with Messrs. Faija and Co. in their recent letter that samples of materials from Ireland can be tested with equal facility and convenience at their testing house at Westminster as at a testing house situated in a central situation in Ireland. The samples could no doubt be generally forwarded without difficulty, but many engineers like to see their test-pieces, or samples, dealt with personally; the expense entailed in travelling and the time occupied, however, usually prevents a man going to London for the special purpose of seeing a few tests made. Some time ago the writer spent something like £200 in the course of a few years in payment to inspectors and in travelling to England to inspect and to test material. A good deal of this expense might have been saved if there had been a testing-house in Dublin, as his inspectors could then have sent him over test-pieces for testing at home.

* * * *

With regard to Messrs. Faija and Co.'s protest against the establishment of a public testing-house in connection with one of the universities, the writer quite recognises the strong arguments against such a course, but in a country where there is little or no probability of a private firm taking up the testing of materials, there is an excuse for the writer's suggestion, and he does not quite see why the Agri-

The Surveyor
And Municipal and County Engineer.

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culture and Technical Department of Ireland might not test certain materials for public authorities at least equally with the National Physical Laboratory at Teddington.

* * * *

Cork University College Laboratories.

When the writer referred in his notes of December 29th to the want of a testing house in Ireland, he was not aware that a considerable amount of testing was carried out every year in the laboratories attached to the Engineering School of the University College, Cork. These laboratories appear to be now fully equipped, the testing-house, in particular, being fitted out with some of the most modern machines and tools necessary for testing purposes. In addition it is under the personal direction of Mr. C. W. Alexander, the well-known Professor of Engineering, and it may therefore be assumed that any tests made of materials at the university will be strictly accurate, and may be relied on. These laboratories, besides being most useful and valuable in the training of the university students and for the testing of material for public bodies, afford also opportunities for carrying on special research work by the professors and advanced students at the college.

* * * *

Reinforced Concrete Investigations.

At present Professor Alexander is engaged in investigating the strength of concrete and reinforced concrete under adverse conditions. A study of the behaviour of concrete under different forms of reinforcement, and subject to various stresses, is a branch of engineering which can no doubt be best investigated by a man who can determine rapidly and with accuracy the stresses which theory shows should exist in any combination of reinforced material, and who can then in a well-equipped workshop compare the results obtained theoretically with those obtained when the reinforced material is actually tested under various loads. It is to be hoped that Professor Alexander will shortly publish particulars of his investigations in connection with reinforced concrete, so that engineers may be able to study the results obtained by him in connection with a subject which presents so many complex and varying conditions, and for which formulæ are useless unless checked by careful experiments.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Does it not add to the fame of that great engineer, Brunel, to read that the Clifton Suspension Bridge, which was erected fifty years ago, has never, since its construction, been closed to traffic for a single hour, night or day, and that the repairs that have been executed during this long period have been only of a very trivial description? When we consider the exposed position of this bridge, do not these facts speak well for the engineer and the contractor?

* * * *

Does not the paper by Mr. Goldbeck on "Causes of Cracks in Concrete Pavements," in the issue of THE SURVEYOR of the 23rd ult., make us wonder how concrete roads ever survive the attacks of temperature, moisture, traffic, &c.? Does he not elaborate the effect of these enemies to concrete roads in such a manner as would almost make us despair that we could ever overcome them? But when we read the last paragraph, or conclusions, of this paper, is it not a relief to find that if certain simple precautions are taken, which, by the way, are generally adopted by engineers, all these causes of failure should disappear?

* * * *

Is it not rather interesting to read that the American Society of Civil Engineers have been trying to estimate the average earnings of American civil engineers, and that the committee appointed to investigate the subject has produced a report fixing the yearly emoluments at 3,985 dollars (say £800 a year)? If the same investigations could be made in this country would not the result show a much less sum than this, especially during the war?

* * * *

Will the "Safety First" Council be able to alter the present practice of pedestrians keeping to the right on the footpath, and induce the public to keep to the left, which is evidently safer for many reasons? Will it not be a difficult matter to alter a custom and habit which is of very long standing? Will the council be able to influence the Chief Commissioner of the Metropolitan Police to make an order that pedestrians shall keep to the left, and instruct the police to see that the order is obeyed, or will the council obtain the services of a large number of people who, by persistently keeping to the left, will gradually induce others to follow their example?

* * * *

Apropos of the above, what was the original factor that made pedestrians keep to the right? Was it when men mostly carried swords which required room when drawn out and flourished in their right hands? Was it because the hat was raised and flourished in the right hand and required space for this action, or was it because carters, leading horses, preferred the surface of the pavement to that of the road?

* * * *

Was not a very novel and ingenious method of advertising adopted in THE SURVEYOR recently, when at intervals extending over several months a whole page was devoted to a single letter of the alphabet, forming part of the trade name of the new process for combating corrosion difficulties in metal and other materials, and rendering brickwork, concrete, and stone impervious to moisture? Were we not all wondering what would be the final word, and until it was revealed in last week's issue, were not our feelings somewhat akin to those of persons consumed by curiosity when reading a novel, who turn to the last pages of the book to see "how it all ends"?

* * * *

Is not Mr. Lawrence W. Chubb's paper on "Highways and Byways," which he gave to the Royal Society of Arts, a most interesting and intellectual summary of the question of the public rights on the "King's Highway"? As to the question which arose during the discussion, as to why so many traces of the ancient Roman roads in this country have disappeared, was this principally because, following the Roman occupation of this country, nearly everything useful seems to have been neglected and allowed to pass into decay?

Correspondence.

Εἰς ἀνὴρ οὐ πάντ' ὁρᾷ.

(One man does not see everything.)—Euripides.

USE OF STUDS ON ROAD LOCOMOTIVE WHEELS.

To the Editor of The Surveyor.

Sir,—The road surveyors to public bodies throughout the country can only have one opinion regarding the Order issued by the Local Government Board withdrawing, during the duration of the war, the restrictions prohibiting the use of studs in the driving wheels of locomotives. Public roads at the present time seem to be of very little importance. The labour upon them has been cut down by 50 per cent, and it has become exceedingly difficult to obtain material. If the traffic had correspondingly decreased there would be nothing wrong, but in many rural districts there has never been so much heavy traffic to contend with as at present. The haulage of timber alone is abnormal. With the increased cultivation of land there must follow an increase of traffic. Halve your labour and material, and increase the traffic, and allow what was previously illegal destruction to go on, and what follows?

The Traction Engine Owners Association are powerful; they have the sympathy of the agriculturists, and the combined body have now evidently the full sympathy of the Local Government Board. There are two sides to every question, but in this matter only one has a chance. On the one side the traction-engine owner pleads that his engine cannot travel on slippery roads with smooth wheels—granted. The farmer says that he must have fodder for his cattle during the winter months—also granted. The same trouble existed before the war, and many attempts were made to have the restrictions removed; they have not succeeded until now, but the illegal use of studs has, nevertheless, been practised, and what has been done to stop it? Certainly not the fines of a shilling per time with the sympathy of "His Lordship" thrown in. I have no hesitation in saying that, had the Locomotive Act been rigidly enforced, the present difficulties would to a very large extent have been overcome. There are other means of threshing corn than by heavy travelling machinery. Many leading farmers are now in a position to provide fodder for their cattle during the winter months without the assistance of the travelling locomotive. It only needs the enforcing of the law to put practically every farmer in the same independent position. Traction-engines may for a long time serve their useful purpose for threshing of corn, or baling hay in large bulks, but the time is overdue when every farmer should, with the assistance of an oil-engine, be able to provide fodder for his cattle during the period of bad weather without the assistance of outside help.

Oil-engines and threshing machines are inexpensive in normal times, and the working expenses are small. I believe in an incredibly short time the capital cost of the plant is covered by sums which are saved for hires.

In the process of time we find the means of reaping and threshing are regarded something like this—

Sickle	Flail.
Scythe and [illegible]	Portable horse-drawn engine.
Horse [illegible]	Self-propelled traction engines and oil engines.

To follow—

Motors to reap, thresh, and haul the corn.

When the oil engines and the motors come into their own—which they certainly will do—there will be no more excuses for the scarifying of the King's highways.

What is the other side of the question? This is part of it. Many public highways which were previously to the running of motors required almost entirely for agricultural purposes are now needed for other important traffic, and they are becoming more and more worn. Where roads are extensively used by motors with inflated and other rubber tyres, it has been proved beyond dispute that they can only be maintained in satisfactory repair by using bituminous binding, so as to make them proof against the penetration of water. Under the old system they are easily destroyed and exceedingly expensive to maintain, and they cause a nuisance by dust in the summer and mud in the winter. Thousands of miles of tar-bituminous roads have been provided during the last six years at a very heavy expenditure. This outlay has to a large extent been met by Government grants derived from the taxation of motorists, and undoubtedly this new order by the Local Government Board will, if it remains in force, be the means of undoing this excellent work. I recently examined a stretch of excellent tar-macadamed road, and found that an engine which had gone over it with studs had made 10,560 punctures per mile for one journey; another had made double this number. Some of the holes were 1½ in. deep, and the edges fractured. In both cases a detour might have been made and the tar-macadam saved the damage, but there is no consideration given at all by many drivers, whose only thought is to "get there" by the shortest and quickest way.

There is a desperate amount of overlapping, and I know of numerous cases where ten times more travelling has been done than was actually necessary, and where it might have been avoided with a little organisation. This is serious, especially when engines shifting after dark put in the studs at a small section of ice-bound road, and do not take them out when they come to stretches of perfectly clean surfaces, as in the dark there might be other small sections to encounter where it was actually slippery; and so miles of unnecessary scarifying goes on.

The overlapping will not be so easily understood by English readers.

In England the stacks are large and the barns for storing the threshed corn are correspondingly large. In Scotland the stacks and barns are small, and there are three to four visits made to farms in the latter country compared to one in the former. A dozen visits to a comparatively small farm in Scotland to thresh the season's crop is quite a common arrangement.

Competition amongst the threshing-engine proprietors in Scotland is keener than in the parts of England with which I am well acquainted; this may be good for the farmer, but it is bad for the road engineer.

The system of small stacks, occupying a few hours to thresh, lends itself to the modern use of oil-engine or motor.

Now that the ordinary layman sees how simply and inexpensive they are to work the timidness (of those with little or no mechanical knowledge) is gradually wearing off, and it is, in my opinion, a matter of only a few years when an "all-round" motor for agricultural work will be the rule.

The term "frost-bound" mentioned in the Order includes, of course, clean surfaces, and not merely those actually ice or snow bound.

The tar-treated waterproof road is not a fancy road put down simply to please the motorists. It is put down because nothing else will withstand the modern traffic, and if it is allowed to be broken up, and Government grants were to cease for this class of work, it would become a serious burden on the local ratepayer, and the agriculturist would himself have a serious cause to complain.

The county road surveyor at the present stage is not to be envied. He has half the usual labour at his disposal, difficulties in getting supplies of material, and increased traffic to keep going, and he is now to see miles of trunk roads scarified without power to interfere. Roadmen also are human, and I have myself had to use considerable persuasion to keep men from giving up their places in disgust. A man taking a proper interest in his work (and this is a man worth keeping) cannot tolerate seeing the result of his labour mutilated.

It is not generally known that, while in England all locomotives are registered and taxed if used for hauling, there is no such arrangement North of the Tweed. In that happy land the fortunate owners of such machinery have nothing to worry about.

Heavy locomotives were practically out of control before the Local Government Board conferred these last favours upon them; they are entirely so now.

At the last International Road Congress the foreign delegates who inspected many of the main roads in this country were unanimous in their opinion that the British roads were the best in the world. Is it not a pity to see them destroyed? They will be wanted later on.

Every British road engineer can rise to the occasion and provide suitable roads to meet the requirements of the day, but he cannot do this if his good work is to be mutilated. Both sides of this important question must have equal consideration.—Yours, &c.,

SCOTTISH COUNTY ROAD SURVEYOR.

February 24, 1917.

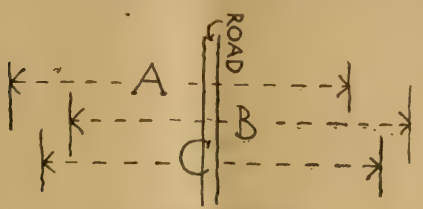
CIVIC SURVEY OF SOUTH-EAST LANCASHIRE.

To the Editor of THE SURVEYOR.

SIR,—I do not intend to occupy much of your space with a discussion which, without illustrations, is almost impossible to follow. I must say, however, that I am glad that my letter unmasked the feeling which I realised underlay the passing reference by the writer of your town-planning article, though I regret that it did not draw forth his name. His reply shows that he was frankly hostile to the Civic Survey, which he treats with uniform unfairness; and I do not regret that I omitted his "damning faint praise" in my former letter.

One point, however, I must take. The "writer of the letter" endeavours to call up the evil passions of professional men by trying to put architects against surveyors; but I am happy to say the work of the Civic Survey has been undertaken by fully-qualified surveyors as well as architects, though the fortunes of war have left more architects in need of this work than surveyors. We have also had, with one or two exceptions, the greatest help and encouragement from county, borough, urban and rural district surveyors, and I am glad to say they have expressed their general approval.

As to the traffic plan, I regret that the writer did not read my letter more carefully—he is still harping on the fact that it does not give every surveyor in S.E. Lancashire full information as to necessary width of every road, the quality of surface required, &c.; in fact, that it is not an encyclopædia instead



A. Morning's maximum.
B. Evening's maximum.
C. Average maximum.

of a single plan. If the writer had ever thought beyond his parish pump he would have known that a plan showing the general streams of traffic of South-eastern Lancashire was a useful production, though it was not the elixir of the road problem. The particular inaccuracy he quotes, as vilifying the whole plan, is simply explained: the *maximum* traffic on a certain road between Pendlebury and Manchester is about the same during two hours of the day, one in the morning, the other in the evening; only in one case the outgoing, and in the other the ingoing, is slightly the greater (the total being the same). On our plan we showed the morning's maximum; if we had taken the evening's as well, and struck an average, we should have got the *same width of traffic line*, but it would have been ¼ in. further to one side than our plan (15 ft. by 12 ft.) shows it. If the writer of your article had used our plan for the purpose of suggesting a road-widening (for which detailed use it was not intended), he would, I suppose, have widened his road on one side *only*: but I would point out to him the evening's traffic on the other side would have found the widening just as useful, as it is not the practice to put a fence down the middle of our roads. The accompanying diagram will, perhaps, explain the matter more clearly.

As to the detailed nature of the traffic, this can be ascertained by a reference to the census sheets, modelled on the Road Board's, which, of course, must be used in company with the plan. The criticism of the local municipal engineer at the meeting referred to amounted to an interesting explanation of a certain feature of the plan: a similar commentary on the whole plan, compiled from local knowledge, will be extremely valuable, as the plan itself only records phenomena, and does not explain them.

No, we do not think the work at all stupendous, and were quite aware that the surveyors of the seventy local authorities were taking much more detailed information in August, 1914; if they had completed it, we should have probably compiled our plan from the information which, we do not doubt, they would have been kind enough to give us. But I would point out that if each local authority had two men on the job, they would have had 140 at work; our staff consisted of twelve. We do not suggest that this staff has done the work of 140, but only a small fragment of it—just enough to produce a general road-traffic plan of S.W. Lancashire, which I modestly claim is neither "misleading nor inadequate," to give some idea of the nature of the problem before the general public and local authorities. If only the war had not broken out, we should have had the much fuller information—the Road Board or Board of Trade might have produced this general plan, and your writer would have been happy and contented.

His remarks on the other plans show that he had not taken the trouble to look at them with understanding: there was no 1/2500 plan prepared for water engineers at all, and the other plan, the "futurist art" one, is not very clearly indicated in his letter: I know some people find a plan hard to read if it has more than two colours upon it.—Yours, &c.,

PATRICK ABERCROMBIE,
Hon. Director, Civic Survey of South Lancashire.

Liverpool,
February 20th, 1917.

CREMATION AND PREMATURE BURIAL.

To the Editor of THE SURVEYOR.

SIR,—The allusion to cremation in your excellent journal of the 9th inst. reminds one that on p. 325 of the second edition of "Premature Burial and How it may be Prevented," by Walter R. Hadwen, M.D., &c., is the following: "While agreeing with this distinguished authority (the late Sir Henry Thompson, F.R.C.S.) as to the advantages of cremation from the sanitary and æsthetic points of view, which he dwells upon in the treatise ('Cremation') referred to, and admitting that a certain amount of protection against live burial is obtainable by means of the dual medical inspection, we cannot agree that this protection is absolute. Cases of trance are on record where some half a dozen doctors, after careful examinations, have pronounced a cataleptic patient to be dead, and the patient, in defiance of their united opinion, has recovered consciousness and been restored to health." The only way to insure that people are not buried alive is to wait until putrefactive decomposition has unmistakably set in before the disposal of a body. And the Association for the Prevention of Premature Burial advocates the establishment of waiting mortuaries where the apparently dead can be watched and kept until resuscitation takes place or death is scientifically proved to have occurred.—Yours, &c.,

JAS. R. WILLIAMSON.

100 Chedington-road,
Upper Edmonton, N.
February 17, 1917.

BUILDING BY-LAWS.

To the Editor of THE SURVEYOR.

SIR,—We are on the eve of the most radical change in house-building since the year 1666. Before the great Fire of London the people dwelt in low, dark, wooden houses, but as five-sixths of the City of London and 132,000 houses were burnt out, it was necessary to rebuild in brick to prevent future fires.

The problem before the British authorities is different, inasmuch as fire does not play any part in the great need there is for cottages. There are two causes of the dearth of houses, and they are both well known and acknowledged.

I think the remedy has already been partially solved by the British Government in the manner

adopted in building hundreds of houses for the municipalities.

Some of your readers will be surprised to learn that hundreds of houses have been erected with 9-in. coke breeze exterior walls, the walls and roof being supported by coke-breeze piers. The exterior has been rendered with two coats of Pudlocel cement, and in no case have any complaints been received as to instability or dampness.

It would be just as consistent to complain of the inability of a sheet of glass ¼-in. thick to keep out driving rains and other inclement weather, as to argue that a ½-in. waterproofed cement could not accomplish the same purpose.

The tendency is to build commodious sun-swept houses which are sufficiently stable to be weather-proof. The man who can invent anything towards this end should certainly receive due consideration by the committee which will undoubtedly be appointed (at the end of the war) to investigate the quickest and best means of housing British workers.—Yours, &c.,

J. H. Kerner-Greenwood.

February 27th, 1917.

To the Editor of The Surveyor.

Sir,—In the last part of Mr. Gordon Allen's letter, published in your issue of the 16th inst., he states that he is erecting a tiny cottage for an agricultural worker the drainage from which consists of merely sink waste. But the local authority insists upon a cesspool being built.

In my district the council would under similar circumstances not require a sink or drain at all if it could be shown that the slop water from the cottage would be small in quantity and could be satisfactorily disposed of by being thrown on to the garden away from the house without causing a nuisance.

If, however, the owner requires a sink and drain, he must construct a watertight cesspool, with ventilator at least 50 ft. from the house, and convey the sink waste thereto by means of a sound drain, suitably intercepted and ventilated, and provided with means of access.

Will Mr. Allen point out in what way these requirements are harsh or unreasonable in view of the necessity of "keeping up a high sanitary standard"?—Yours, &c.,

Rural Surveyor.

February 26, 1917.

INSTITUTION OF CIVIL ENGINEERS.

EXTRA MEETINGS.

An extra meeting of the Institution of Civil Engineers has been called for the 12th inst., when Mr. Edgar Crammond will deliver a lecture on the subject of foreign trade and its relation to the investment of capital abroad. The chair will be taken at 5.30 p.m.

In advising us of the fixture, Dr. J. H. T. Tudsbery, the secretary of the institution, writes:—

"I take the opportunity to inform you that the council hope to arrange for the delivery, at further extra meetings, of lectures on the decimal system of coinage, weights and measures, and on the standardisation of engineering materials. It is thought that the consideration of these subjects is of special importance to engineers generally at the present time. Discussion of the issues raised by the lecturers will be invited."

INSTITUTION OF MUNICIPAL ENGINEERS.

The annual meeting of the Northern District of the institution will be held at Newcastle-on-Tyne to-morrow (Saturday).

Irish Canals. In reply to a question in the House of Commons on Friday last, it was stated that, as at present advised, the Board of Trade saw no particular reason for taking over the control of Irish canals.

Steel in Reinforced Concrete. A paper, entitled "High Tensile Steel *versus* Mild Steel for Reinforced Concrete," will be read by Mr. Arthur W. C. Shelt at a meeting of the Society of Engineers, to be held at Burlington House, Piccadilly, W., on Monday next, at 5.30 p.m.

HIGH WYCOMBE FERRO-CONCRETE BRIDGE TESTS.

In November last a new highway bridge at High Wycombe, Buckinghamshire, was officially tested under the direction of Messrs. David Balfour and Son, of Newcastle-upon-Tyne, the engineers appointed by the Local Government Board to supervise the construction and testing of the bridge, which was built in Mouchel-Hennebique ferro-concrete from the general designs of Mr. F. J. Rushbrooke, the borough surveyor, in accordance with working details prepared by Messrs. L. G. Mouchel and Partners, Limited, of Westminster.

The bridge consists of a single arch span of 30 ft. between the abutments and measures 36 ft. wide between the parapets. The carriage way is 24 ft. wide, having a 6-ft. foot-walk on each side, the parapets being formed and spandrels being also of ferro-concrete.

Provision was made for a total test load of 35 tons, made up as follows:—One steam roller, 10 tons weight; one steam traction engine, 15 tons; one lorry, laden with tree trunks, 10 tons; total weight, 35 tons.

For the purpose of registering deflection of the arch under load three sensitive deflectometers of the Mouchel type were placed on trestles in the stream beneath the bridge, instrument No. 1 being at the centre, instrument No. 2 midway between the centre and the springing on the south side, and instrument No. 3 midway between the centre and the springing on the north side.

Particulars of the tests conducted and the results observed are quoted below from the report made by Messrs. David Balfour and Son.

Test No. 1, steam roller (10 tons) on centre of bridge.—Result: No deflections.

Test No. 2, traction engine (15 tons) on centre of bridge.—Results: Deflection of three-tenths of a millimetre, or 1/85 in., at the centre of the span, but no deflection at the sides.

Test No. 3, traction engine (15 tons) with lorry (10 tons) behind.—Results: Deflection of two-tenths of a millimetre, or 1/128 in., at the centre of the span, and a deflection of one-tenth of a millimetre, or 1/256 in. at the sides.

Test No. 4, traction engine (15 tons) with lorry (10 tons) on centre with steam roller at side on centre line.—Results: Deflections of one-tenth of a millimetre, or 1/256 in., at the south side; one-tenth of a millimetre, or 1/256 in., at the north side; and three-tenths of a millimetre, or 1/85 in., at the centre of the span.

Test No. 5, Traction engine (15 tons), lorry (10 tons) and steam roller (10 tons) side by side across the centre of the bridge (total load, 35 tons).—Results: Deflections of three-tenths of a millimetre, or 1/85 in., at the south side; three-tenths of a millimetre, or 1/85 in., at the north side; seven-tenths of a millimetre, or 1/26 in., at the centre of the span.

The results stated by Messrs. D. Balfour and Son are (says *Ferro-Concrete*) sufficiently demonstrative as to the highly conservative nature of the design, for the maximum deflection of 1/36 in. under the full test load is only a shade more than 1/13000 of the span of the arch.

This implies a very high factor of safety and a reserve strength far greater than that demanded for withstanding the moving loads specified by the Local Government Board.

The excess of elastic strength possessed by the bridge over that stipulated should not be regarded either as an accidental occurrence or as an evidence of wasteful design. On the contrary, it is the result of a theory entertained by the Local Government Board to the effect that a monolithic ferro-concrete bridge structure must be considered as if it consisted of an indefinite number of longitudinal strips, each capable of acting quite independently of all other longitudinal strips making up the width of the structure. It is well known to engineers who have studied the subject of applied mechanics that a condition such as this cannot exist in an arched or other framed structure of iron or timber, and it is still more impossible in the case of monolithic ferro-concrete construction, where the absolute continuity of the material in every direction results in a condition of perfect inter-dependence and enables parts of the structure not under the direct influence of the

loading applied to contribute effectively to the resistance of those parts which are loaded or are subject to strain of any kind.

An interesting proof of the foregoing statement of fact is afforded by a comparison of Tests No. 1 and No. 5 of the bridge at High Wycombe.

Thus, in Test No. 1, when the 10-ton steam roller was placed at the centre of the span the deflection was so small that it could not be measured on the highly sensitive instrument employed. But in Test No. 5, when the 10-ton steam-roller, the 10-ton lorry, and the 15-ton traction engine were placed side by side in parallel across the centre of the span, the maximum deflection on the centre line reached seven-tenths of a millimetre.

In the first case, the 24 ft. wide roadway had one foad of 10 tons on the middle third, and if that part of the arch carrying the roadway had been capable of acting, in accordance with the Local Government Board theory, as if it were made up of three independent longitudinal strips, each 8 ft. wide, it is obvious that the load would have caused a very perceptible deflection. The reason why no deflection could be detected was that the strain caused by the 10-ton load was distributed right and left to a far greater distance than that fixed by the arbitrary limit imposed on the designers, the result being that the assistance afforded by the outer portions of the arch to the portion immediately under the load was so important that the load made practically no impression on the bridge.

On the other hand, when the three vehicles were placed side by side at the centre of the bridge, the two outer thirds of the arch were engaged in withstanding the stresses due to the two outer loads, and it must be borne in mind that each of the two outer thirds had the assistance of a strip of the arch beneath the footpath and kerb, and also beneath part of the roadway outside the outer wheels of the load. The only part of the structure then available for withstanding the stresses due to the 10-ton load over the middle third was the strip immediately beneath the load. Consequently the deflection was more perceptible than in the case of Test No. 1, and, for the reasons stated above, it was greater under the middle load than under the two outer loads.

Thus the comparison of the tests mentioned absolutely contradicts the erroneous theory to which allusion has been made, and throws useful light upon the question of the stresses in ferro-concrete.

A STREET ACCIDENT.

AN EMPLOYER'S ACTION AGAINST CORPORATION.

At Durham Civil Court, on Wednesday, Mr. Justice McCardie and a special jury heard an action in which Messrs. Waggott Brothers, a Sunderland firm of butchers, claimed an indemnity of £308 odd from the Corporation of Sunderland. On behalf of the plaintiffs it was stated that they had had to pay the money in respect of the death of a workman in their employment. Under the Workmen's Compensation Act, if the employer could show that a fatal accident was really due to the negligence of somebody else, then that other person must indemnify the employer. On June 13th last a man named Bowman was driving a butcher's cart for the plaintiffs when the horse slipped and fell, and Bowman's skull was fractured, and he died two days later. The widow claimed compensation, and was paid £300 and a small sum for costs. The road was paved with wood blocks, and was repaired in the previous March or April, when tar or pitch was put on the surface and was allowed to cover the surface of the blocks. When the weather became warm the tar turned soft and sticky, and it was on this account that the horse slipped and fell. Plaintiffs alleged that the corporation were negligent in allowing tar to be placed on the wooden blocks. For the corporation it was submitted that the fatality was the result of an ordinary street accident, and that consequently the corporation was not liable.

The jury found that the corporation was guilty of negligence, and that such negligence caused the death. They also found that the accident arose out of the man's employment.

His lord-ship deferred judgment to allow defendants an opportunity of legal argument if they desired.

WAR CONTRACTS LEGISLATION.

COURTS' EMERGENCY POWERS.

In the House of Commons on Wednesday, the Solicitor-General (Sir Gordon Hewart), in moving the second reading of the Courts (Emergency Powers) Bill, said it was introduced to meet certain practical difficulties which had arisen in the working of previous emergency legislation during the war. The Bill was divided into three parts. The first part dealt with contracts. In March, 1915, relief was given by Statute in certain cases where the fulfilment of contracts was interfered with by the necessity of complying with requirements of the Army or Navy under the Defence of the Realm Act. Experience had proved that that protection, valuable as it was, did not go far enough. It left untouched the legal position of many persons who, before the war, entered into contracts for the construction of buildings, and found that, by reason of circumstances attributable to the war, although they were not able to point to requirements of the Government, it was impossible for them, without serious hardship, to perform their contracts within that stipulated time. In general, an excellent spirit of accommodation had been shown, but there had been some hard cases, where the other parties to the contract either would not, or, because of their special position as trustees or local authorities, could not, relax the stipulations of the contract. The first clause of the Bill proposed to empower the Court in proper cases to suspend or annul the contract. The Court, however, had to be satisfied that the performance of the contract was prevented or rendered gravely onerous by difficulties due to the war, either in regard to labour or materials. An applicant might show that by reason of the war his supply or delivery of materials was prevented or restricted or delayed, or he might show that the war had occasioned diversion or insufficiency in his supply of labour. In either event, the Court might suspend or annul the contract on suitable conditions in the discretion of the Court, regard being had to all the circumstances of the case.

The Bill was read a second time.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRY HELD.

Watford U.D.C. (February 19th). Mr. R. C. Maxwell).—This was an inquiry into an application for the issue of a Provisional Order to extend the limits of the supply of water by the council in view of the contemplated extension of the council's area after the war.—Mr. W. Hudson, the clerk, stated that the inquiry had been rendered necessary by the promotion on the part of the Rickmansworth and Uxbridge Valley Water Company of a Provisional Order to extend their area, but he was pleased to say that a satisfactory agreement had been arrived at with the company with regard to the matter.—Mr. D. Waterhouse, engineer to the urban district council, described the position of the six new wells and pumping plant capable of increasing the output of water to 3¼ million gallons per 24 hours, as compared with 1,100,000 gallons hitherto. Water softening apparatus had been provided. The extra cost of the work up to date had been £65,000, and after the war it was proposed to proceed with the construction of a reservoir and main extensions which would increase the total cost to £11,000. The charge on the rateable value of the district for water purposes was 5 per cent. for domestic supplies and 15 per 1,000 gallons for trade purposes by meter.

APPLICATIONS FOR LOANS.

Norwich T.C. £3,500 for the building and equipment of an electricity sub-station.

Dorking U.D.C. £3,500 for the purchase of property for the South-street improvement.

LOAN SANCTIONED.

Hull T.C. £60,000 for extensions in the electricity department.

FORTHCOMING INQUIRY.

MARCH. £

6. **Atherton.** For the purchase of land for a housing scheme (Mr. H. A. Chapman) —

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Accrington T.C.—A proposal to build a fire station at the junction of Manchester-road and Grange-lane is being considered by the Watch Committee.

East Ham T.C.—The architect to the Education Committee has been instructed to complete plans for converting the infants' department of the school in High-street into a special centre for mentally defective children, and also the plans for a mixed school for 600 children.

Gillingham T.C.—The borough surveyor, Mr. J. L. Reitem, has been authorised to carry out painting and repairs to a number of schools during the ensuing financial year, at an estimated cost of £353.

Salford T.C.—The Education Committee recommend a scheme for the erection of a public elementary school at an estimated cost of £26,680, including £6,680 for the purchase of the land.

HOUSING AND TOWN PLANNING.

Bingley U.D.C.—The surveyor, Mr. H. Bottomley, has received instructions to prepare plans of suitable sites for workmen's houses which it is proposed to build after the war.

Birmingham T.C.—The Special Committee on Housing, whose sittings have been in abeyance since October, 1914, have resumed work by deciding to proceed with the consideration of the further recommendations they have to make to the city council. It is not intended to put any proposals into effect until after the conclusion of the war.

Coventry T.C.—The council on Tuesday had before them the scheme of the Ministry of Munitions for the erection of 214 houses on the London road, and assented to the plans presented by Mr. G. L. Pepler, town-planning inspector of the Local Government Board.

Mynyddislwyn U.D.C.—Plans are to be prepared by the architect for 200 houses, which it is proposed to build after the war at an estimated cost of £12,000.

Northfleet U.D.C.—The council will consider at the next meeting a request from the Local Government Board that they should submit plans for the proposed housing scheme on the Northfleet estate, to consist of 147 dwellings.

Paisley T.C.—The Housing and Town Planning Committee report that they have instructed the burgh surveyor, Mr. I. Lee, to prepare a plan showing what area he considers should be laid out for the erection of houses after the war. They consider that a start might be made with vacant ground in Albion-street, where 24 four-roomed houses could be built.

Sedgley U.D.C.—A sub-committee has been authorised to prepare a scheme for the erection of fifty workmen's dwellings as soon as the present restrictions upon borrowing money are withdrawn.

MOTOR TRANSPORT.

Baildon U.D.C.—The Wharfedale Hospital Board have made a proposal to the council for the joint purchase of a motor ambulance, at a cost of £600.

Bradford T.C.—The corporation are arranging for a fleet of motor lorries for the delivery of coke to the mains by horses under the work and motor the mains. A report of the street cleansing department shows that a motor sweeper does its work along a length of 3½ miles in twenty minutes, at a cost of 1s. 10d.; while the same labour takes one hour and a quarter at a cost of 3s. 9d.

Edinburgh T.C.—The purchase of a new petrol-motor fire engine is recommended by the sub-committee of the Plans and Works Committee.

Lanchester R.D.C.—It has been agreed to purchase a motor motor for haulage at a cost of £695.

Sunderland T.C.—A decision has been reached to purchase another motor fire engine.

ROADS AND MATERIALS.

Aberdeen T.C.—It has been decided to carry out widening schemes in Clifton-road and Canal-road.

Barnstaple R.D.C.—The Devon County Council have written that, so far as main road and quarry work was concerned, it was hopeless for them to get prisoners of war to do the work. Prisoners were only allowed out in big quarries somewhere in the neighbourhood of existing camps, or where there was sufficient work to justify the authorities in providing a camp. The highway surveyor, Mr. A. A. Richards, having reported that the contracts for the road expired on March 31st, it was agreed to empower him to make arrangements, if possible, to keep the same contractors at the existing prices.

Brighton T.C.—The town council last week agreed to engage some women as roads-sweepers—for some of the lighter parts of road work, such as they will be able to undertake. It is proposed to give the women uniforms and hats and to pay them 5d. per hour. It was expected, the chairman of the Works Committee stated, that it would take three women to do the work of two men.

Camberwell B.C.—The borough engineer, Mr. W. Oxtoby, in his statement with respect to the estimates for 1917-18 states that he has estimated for the same amount as last year. The roads had stood the strain of last year very well, which he considered was largely due to the tar-spraying, but he fears they will show a greater depreciation during the coming year, and it is most likely that a large number will require relining. He has again provided £1,500 for sett paving, as the wood-paved roads are getting very bad, and he considers it cheapest to lay setts by way of repairs. Many of the wood roads are getting to the end of their life, and in the near future will have to be relaid at a very heavy cost. He adds that he has provided for no Sunday or Saturday afternoon watering, and for very little day watering. Now that all the macadam roads have been tar-sprayed, and will be re-tar-sprayed some every year, some every other year, and the others every third year, he is of opinion that they require no watering. The tar-spraying can be done for very little, if any, extra expense to the cost of watering, and he is convinced that from a health point of view, as well as from an economic point of view in regard to the life of a road, it is highly beneficial, and in the future will be universal, and the old system of watering die out, but at present he does not deem it advisable to discontinue watering altogether, as on some days in market and shop centres it may be necessary.

Chorley T.C.—It has been decided to purchase a Wadsworth machine for clearing away snow, and to utilise it for scattering sand.

Essex C.C.—It is estimated by the Highways Committee that the total expenditure for 1917-18 on roads and bridges will be £201,350, comprising £98,355 for materials, team labour, £30,629 for manual labour, £46,500 urban district councils.—Alderman H. E. Brooks, at the council meeting, said that the roads in certain parts of the county were getting into a very bad state, and he was afraid they would have a very big expenditure later on.—Alderman Beal said that the Road Board were in possession of nearly all their plant; a great deal was in France. After the war, he was perfectly certain that the board would do everything possible to assist them and make good the loss on the roads.

Grays U.D.C.—The surveyor, Mr. A. C. James, has received instructions to prepare particulars of the proposed Whitehall-lane improvement, which it is proposed to carry out after the war, at an estimated cost of £5,000.

Hants C.C.—Two divisional surveyors have been released for road construction abroad, and it has been agreed to advance the salary of each of the two remaining divisional surveyors at the rate of £100 a year in consideration of their taking over an additional division of the county, and also give them an additional allowance of £80 a year in respect of travelling expenses.

Huddersfield T.C.—Plans have been completed of the proposed new road from Ashgrove-road to Dalton Bank.

Kent C.C.—It has been agreed to reinstate a number of roads in the Cheriton district at an estimated cost of £7,600, towards which the Government will make a contribution. The council will also contribute £150 towards the scheme for widening the Cheriton road at its junction with Risborough-lane.

Kirbymoorside R.D.C.—The Road Board have made a grant of £115 to the council to meet the cost of repairing the damage caused to a section of road in Swineherd-lane by timber-loading, which was being done under Government contract. It was intimated that this would not preclude the council from making a further application when the money had been expended.

Midlothian C.C.—The Suburban District Committee have agreed to a scheme of tar work to be carried out on the roads in the district during the year 1917-18, in respect of which work a grant is to be asked from the Road Board. In connection with this matter the committee had under consideration a report by the district surveyor dealing with the large amount of military traffic on the roads in the district, and also the increase in the motor-bus services consequent on the restriction of train service, and it was resolved to bring these points forcibly before the Road Board when making the application for a grant.

Morecambe T.C.—The town council are making application to the Government for a grant towards the maintenance of Lancaster-road and Torrisholme Moss-lane.

Norfolk C.C.—The Eastern Highways Committee have appointed a committee to consider a proposition by the Road Board to contribute 50 per cent of the cost of making up a section of main road in an urban area, the estimated cost of which is £1,147.—The county surveyor, Mr. W. W. Gladwell, has reported to the Eastern Highways Committee that the Bills Committee had received thirty-two tenders for gravel, chalk, &c., as against twenty-six last year; ten tenders for tools and implements as against twelve, and eighty tenders for team labour as against 154 in 1914. The committee recommended the acceptance of tenders for gravel, flint, and chalk, also for team labour, the maximum price per day for single horse, cart, and man to be 10s., and for two horses, cart, and man 16s. per day, except in the neighbourhood of Norwich and a few other localities, where a slightly higher price might have to be paid. Prices generally were higher than last year.

Westminster B.C.—The Works Committee recommend that tenders be obtained for paving with wood or asphalt part of Eccleston-street and Knightsbridge.

SEWERAGE AND SEWAGE DISPOSAL.

Axminster U.D.C.—Acting on the suggestion of the engineer, it has been agreed, in order to make the sewerage scheme complete, to carry out an extension on the Chard road at an estimated cost of £1,269. It was reported that in connection with the scheme £9,775 had been expended up to date out of a loan of £11,000. The contract price for the scheme was £8,322.

Hendon R.D.C.—The surveyor, Mr. J. A. Webb, has submitted a scheme of sewage disposal for Harrow Weald, estimated to cost £19,000. The council have agreed to send the scheme to the Local Government Board for their approval.

Lambeth B.C.—The Public Health Committee recommend the construction of new sewers in Woodland-road and Woodcote-place, at an estimated cost of £3,000. They also advise other expenditure on sewerage works amounting to £3,500.

Luton T.C.—The borough engineer, Mr. J. W. Tomlinson, has received instructions to prepare a report and estimates of the cost of improving the main sewerage system.

Newry No. 1 (Co. Down) R.D.C.—The Local Government Board for Ireland have made a Provisional Order empowering the council to put in force the provisions of the Land Clauses Act with respect to the purchase and taking, otherwise than by agreement, of certain lands for the purpose of improving the sewerage of the town of Rathfriland and its neighbourhood.

WATER, GAS, AND ELECTRICITY.

Birmingham T.C.—A meeting of the Electric Supply Committee was held on Wednesday, when their reply to the report of the special committee appointed to inquire into the affairs of the department, with particular reference to the failure to supply sufficient current for the needs of the city, was revised. The special committee made a thorough investigation of departmental matters generally. Their report contains a brief history of the department since it was acquired by the corporation from a private company, an indication of the gradual development of the undertaking, and a detailed opinion as to the causes which led to the failure to supply an adequate amount of current to the tramway department. The main reason for this failure, it is pointed out, was due to over-pressure, resulting from the heavy demands for electricity by munition factories and other establishments. The report, together with the committee's explanation of some of the comments contained in it, will be brought forward for consideration at the next meeting of the city council.

Bristol T.C.—The Works Sub-Committee of the Sanitary Committee reported that they had considered the lighting of the streets for the summer months, and as the chief constable, acting under instructions from the Government, refused to allow any improvement in the gas and incandescent electric lamps, it was decided that as those lamps were of very little benefit in the summer months, to shut them down from the first week in April to September 30th, in order that the workmen might have an opportunity of volunteering for national service. It was also decided to give an increase of 3s. per week to the workmen in the interval.

Heston and Isleworth U.D.C.—In view of the early reintroduction of summer time, the electrical engineer advises an increase to all classes of electricity consumers of 12½ per cent, which makes a total increase of 25 per cent on pre-war prices.

Loughborough T.C.—The Electricity Committee, acting upon a report by the electrical engineer, recommend considerable extensions of the electricity plant. Having regard to the difficulty in obtaining plant at the present time, it was absolutely necessary that orders should be placed at the earliest possible moment if next winter's supply was not to be jeopardised. The total extension advised would entail a cost of about £50,000, but it was recommended that only a part of the scheme should be proceeded with at present, at a cost of £27,225. This would include a larger boiler and a larger turbo set. These proposals have been approved by the town council, and the Local Government Board are being asked to sanction a loan.

Paignton U.D.C.—The Paignton Gas Company wrote intimating that, in consequence of labour difficulties, it was necessary for the company to discontinue the public lighting. Some members considered that arrangements should be made with the surveyor to get the necessary labour, and this course was adopted.

Rotherham T.C.—Steps are being taken with a view to resuming the use of the Ulley water supply for domestic consumption. Dr. Houston, of the Metropolitan Water Board, has been asked to advise the corporation on the subject. There is a reservoir at Ulley which holds a supply sufficient for about 150 days for the borough. The capital cost was £60,000, but the water has not been used by the corporation for eight years.

St. Ives T.C.—In connection with the suggestion of the borough surveyor, Mr. S. Palmer, that a scheme of supplementary water filtration should be carried out, the town council have accepted the offer of Mr. Cook, of Barnoon, St. Ives, to make, free of charge, three sets of the necessary filtering media for the purpose of testing the borough surveyor's proposal.

Southend T.C.—Having considered the extension of the generating plant in order to cope with the increasing demand for current, the Electric Lighting Committee have decided that application may be made to the Local Government Board for leave to borrow £45,520 for the provision of additional generating plant at the electricity works.

Stepney B.C.—An estimate of £20,000 has been adopted for the supply of two new boilers for the electricity undertaking.

Swindon T.C.—Additional plant is to be installed at the electricity works, at an estimated cost of £6,000.

MISCELLANEOUS.

Birmingham T.C.—An agreement has been made with the Works Committee of the Birmingham, Tame and Rea District Drainage Board for the disposal of ashes from the electric supply department. The board have taken the ashes for some years and have disposed of them at various points on their works. The arrangement now made is that for an agreed period the board shall deal with about 70,000 tons per annum. This entails considerable work, involving the purchase of canal boats, horses, tip wagons, and 2-ft. gauge railway, but no time will be lost in providing the necessary equipment and in carrying the proposal into effect.

Scrapping the Tramways.—On Wednesday, when the Lancaster Town Council decided to purchase two more motor 'buses of English make, in order to cope with the demand in the town, the chairman of the Tramways Committee said he believed the time was coming when it would pay the corporation to scrap the electric tramways, and to go in for electric motor 'buses.

FOR OTHER ADVERTISEMENTS
See End of Paper.

WANTED - Temporary Assistant Surveyor and Sanitary Inspector (ineligible for Army). Applications, stating age, experience, and salary, inclusive of travelling expenses required, together with copies of testimonials, to be sent to—

R. J. KNAPMAN,
Surveyor and Sanitary Engineer, &c.,
R.D. Council Offices
Whiston,
Prescot, Lancs.

(3,344)

SOUTHALL-NORWOOD URBAN DISTRICT COUNCIL.

ANNUAL CONTRACTS.

From 1st APRIL, 1917, to 31st MARCH, 1918.

The Council invite Tenders for the Supply of—

Granite (Guernsey and Leicestershire).
Lime (Clay Cross and Grey Lime).
Press Cloth.
Carbolic Powder and Acid.
Brooms and Dustbins.
Flints, Hoggin and Gravel.
Horse Hire.
Steam Rolling and Scarifying.
Coal Tar and Oil Tar.

Forms of Tender and particulars can be obtained at the Office of the undersigned any day between the hours of 10 a.m. and 4 p.m. (except Saturdays, 10 a.m. to 1 p.m.). Forms will only be supplied for the items mentioned above, and, to reduce clerical labour, Forms will not be supplied to applicants who have in previous years asked for Forms and have not returned Tenders.

Tenders, sealed and endorsed "Tender for ....," are to be delivered to the Clerk of the Council not later than 4 p.m. on the 13th March, 1917.

The Council do not bind themselves to accept the lowest or any Tender, and may accept part or parts of any Tender.

REGINALD BROWN, Assoc.M.Inst.C.E., &c.,
Engineer and Surveyor to the Council.

Town Hall, Southall
February 21, 1917 (3,342)

STOKE NEWINGTON.

METROPOLITAN BOROUGH OF STOKE NEWINGTON.

The Council invite Tenders for the following Works and Supplies—viz.:

Mason and Paviors' Work.
Carriage of Road Materials, &c.
Water Pipe and Plumbing Work.
Removal of Clinker from Destructor.
Supply of Lime and Cement.
Supply of Drain Pipes, Bends, Bricks, &c.
Supply of Brooms, Tools, and Castings.
Supply of Hay, Straw and Provender.

For particulars and Form of Tender apply to the Surveyor, Town Hall, Milton-road, Stoke Newington.

Sealed and endorsed Tenders to be delivered at the Town Hall by 4 o'clock p.m. on Tuesday, 13th March, 1917.

SIDNEY WHITE,
Town Clerk.

(3,343)

PERSONAL.

Mr. J. P. Cargill, health department, Salford, has been elected a member of the Royal Sanitary Institute.

Mr. F. C. Donaldson, Manchester, has been appointed an assistant in the borough engineer's department, Wigan.

Mr. W. Lionel Jenkins, county surveyor for West Suffolk, has taken up a commission in the Royal Engineers (road construction).

Mr. H. Steuart, assistant burgh surveyor, Aberdeen, has been elected a member of the Institution of Municipal and County Engineers.

Mr. T. R. Swales, borough engineer and surveyor of Maldon, has obtained a commission in the Royal Engineers, for road service in France.

Sir Maurice Fitzmaurice has been appointed chairman of the Committee to Control Canals, which were taken over by the State as from yesterday.

Mr. W. Sowerby, articled pupil to Mr. H. Holmes, Ossett, has been elected to studentship of the Institution of Municipal and County Engineers.

Mr. E. Winfield, chief assistant, has been appointed acting surveyor of Bucks during the absence of the county surveyor, Mr. R. J. Thomas, on military service.

Mr. A. W. Grace, engineer and surveyor to the borough corporation of Launceston, has been elected a member of the Institution of Municipal and County Engineers.

Mr. J. D. Blakeney, assistant engineer and superintendent of works to the British Municipal Council, Tientsin, has been elected an associate member of the Institution of Municipal and County Engineers.

Mr. John Schooler, county road surveyor, Fort William, having been elected a member of the Road Surveyors' Association of Scotland, has had his name added to the roll of the Institution of Municipal and County Engineers as an affiliated member.

Mr. Charles Wood, engineer and manager of the gas department of Bradford Corporation, has been appointed a member of the Corbet Woodall Scholarship Advisory Committee in connection with the University of Leeds, in succession to the late Mr. J. C. Newbigging, engineer to the gas department of the Corporation of Manchester.

KILLED IN ACTION.

Mr. H. G. Stewart-Moore, engineer to the Trustees of the Drainage District of Lough Neagh, has been killed in action at Salonika.

OBITUARY.

Mr. W. J. O'Neill, engineer to the Trustees of the Drainage District of Lough Neagh for upwards of fifty years, died recently, we regret to state. Mr. O'Neill retired from service some time ago.

Mr. William Hunter, M.Inst.C.E., for twenty years chief engineer of the Manchester Ship Canal Company, died on Tuesday at Woodley, near Manchester. He was a past-president of the Manchester Association of Engineers, and a member of the Technical Committee which reported upon the Panama Canal.

Mr. Samuel Arthur Goodall, who had been surveyor to the Fenton Urban District Council for thirty-six years, until the Federation of the Potteries, when he retired, died recently, we regret to state, at the age of seventy-three. His eldest son, Mr. A. A. Goodall, is surveyor to the Rhyl Urban District Council.

Scarcity of Water Taps.—Owing to the difficulty of obtaining supplies of special types of water taps, the Ministry of Munitions recommends all water engineers to relax their regulations, and to accept any effective substitute.

Change of Address.—Owing to the fact that their premises have been commandeered by the Government, Messrs. Mossay and Co., Ltd., have removed to new offices at 7, Princes-street, Westminster, S.W. Telephone No. 2269 Victoria (as before).

St. Paul's Bridge.—The City of London Corporation have applied to the Local Government Board for an extension until August 18, 1918, of the time-limit for the exercise of the statutory powers of compulsory purchase of land in the City and the borough of Southwark, likely to be required for the erection of the new St. Paul's Bridge and its approaches.

ASHBINS AND PUBLIC HEALTH.

PROPERTY OWNER'S UNSUCCESSFUL PLEA.

A case of considerable interest to local authorities was before the Altrincham, Cheshire, magistrates on Monday, when the Hale Urban District Council claimed £1 11s. 6d. from James Haynes Batchelor, of Altrincham, for three ashbins supplied to property owned by the defendant at Hale.

It was defendant's case that, having repaired the ashbins, he had thought that was sufficient, and he wrote to the council expressing his surprise that they should require new ashbins at the present moment when the Government requested economy. The council's letter implied that the Government's request must be ignored.

The council's reply was that the requirements of the authority were essential in the interests of the health of the district, and that it was in the interests of true economy that the sanitary arrangements of the district should be kept in order.

The defendant said he had on the court premises two of the ashbins which he had repaired, and he would ask the Bench to say if such repairs were not sufficient, having regard to the present time. He objected to putting new ashbins in while the Government were asking everyone to economise in materials and labour and to save every shilling. He further claimed that the matter was not of a nature to be a sanitary danger. Further, substantial ashbins could not be bought to-day; those that were purchasable were only like tissue paper.

The chairman said a great deal had been said that had nothing whatever to do with the case. This talk about economy was all very well and proper, but one could not economise at the present time with the health of the community. The council all round had been extremely moderate, and the Bench were quite sure that what was asked for had been essential. An order would be made requiring the defendant to pay £1 11s. 6d. for the ashbins the council had supplied, and 29s. costs, including one guinea for advocate's fee.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—March 5th. Guildford Town Council.—Mr. A. D. Jenkins, town clerk, Guildford.

SANITARY INSPECTOR.—March 9th.—Caistor Rural District Council. £165 a year.—Mr. A. A. Padley, clerk, Council Offices, Caistor.

ROAD FOREMAN. — March 12th. — Barrowford Urban District Council. 35s. per week, with 2s. war bonus.—Mr. A. T. Chandler, clerk, Council Offices, Barrowford.

MUNICIPAL ENGINEER.—May 1st. Municipality of Lahore, India. £1,000—£1,600 per annum.—Mr. H. P. Tollinton, deputy commissioner and president, Municipal Committee, Lahore.

ENGINEERING ASSISTANT.—Conversant with sewerage, sewage disposal, and water supplies.—Messrs. Willcox and Raikes, 63, Temple-row, Birmingham.

ENGINEERING DRAUGHTSMAN.—Corporation of Bolton.—Mr. Lewis Mitchell, waterworks engineer, Town Hall, Bolton.

SURVEYOR'S JUNIOR ASSISTANT.—Weybridge (Surrey) Urban District Council. £75 per annum.—Mr. John S. Crawshaw, surveyor, Council Offices, Weybridge.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

SHEERNESS.—March 14th. For the construction of pumping station buildings and other works, for the urban district council.—The Water Engineer, Trinity-road, Sheerness.

LONDON.—For the execution of ordinary works and repairs to buildings, for H.M. Commissioner of Works.—The Secretary, H.M. Office of Works, Storey's-gate, London, S.W.

Engineering: Iron and Steel.

HARROGATE.—March 5th.—For the supply at the electricity works of a by-product steam boiler, overhead coal bunker, coal conveyer, and structural steelwork, for the corporation.—Mr. G. Wilkinson, borough electrical engineer, 33 Swan-road, Harrogate.

MANCHESTER.—March 7th.—For the supply and erection of a coal-conveying plant and suction ash plant, for the electricity committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall, Manchester.

SWANSEA.—March 10th.—For the supply of cast-iron pipes and specials, waterworks appliances, including valves and hydrants, water meters, pig lead, and steel tubes and fittings, for the corporation.—Mr. H. Lang Coath, town clerk, Guildhall, Swansea.

COVENTRY.—March 12th.—For the supply of cast-iron pipes, lead pipes, solder, and hydrant and valve boxes, for the Waterworks and Fire Brigade Committee.—Mr. J. E. Swindlehurst, water engineer, Council House, Coventry.

MANCHESTER.—March 14th.—For the supply of nine 40-h.p. three-phase slip-ring motors, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall, Manchester.

Mechanically Propelled Vehicles.

BRIGHTON.—March 9th.—For the supply of a steam motor wagon and an electric motor wagon, for the corporation.—Mr. H. Talbot, town clerk.

Roads.

SOUTHWELL.—March 5th.—For the supply of road materials, for the rural district council.—Mr. J. Ellis, clerk, Southwell.

HUNSLET.—March 5th.—For the supply of highway material, for the rural district council.—Mr. W. B. Pindar, clerk, Leak-street, Hunslet, Leeds.

LOUGHBOROUGH.—March 5th.—For the supply of broken granite, for the corporation.—Mr. A. H. Walker, borough surveyor, Town Hall, Loughborough.

NEWMARKET.—March 5th.—For the supply of 3,000 tons of 2½-in. best broken Leicestershire granite, 3,750 tons of 1½-in., and 170 tons of granite chippings, for the rural district council.—Mr. F. J. Blackbourn, acting clerk, Deva-chambers, Newmarket.

HORNCASTLE.—March 5th.—For the supply of 260 tons of X granite, 300 tons of XX granite, 150 tons of X slag, and 70 tons of slag or granite chips, for the urban district council.—The acting surveyor, Court House, Horncastle.

SUNBURY-ON-THAMES.—March 5th.—For the supply of 500 tons of Guernsey, Clee Hill, Burdon Hill, or Charnwood granite, and 300 tons of slag tar macadam, for the urban district council.—Mr. H. F. Coales, surveyor, Council Offices.

WINCANTON.—March 6th.—For the supply of basalt, granite, limestone, quartzite, and tar-macadam, for the rural district council. — Mr. E. H. Knapman, district surveyor, Wincanton.

UPPINGHAM.—March 6th. — For the supply of about 4,000 tons of broken granite and screenings, for the rural district council.—Mr. F. Oakley, clerk, Council Offices, Uppingham.

CHINGFORD.—March 6th.—For the supply of broken British, Guernsey, or Quenast granite, stone ballast, hoggin, boiler clinker, refined or distilled tar, team labour, use of steam roller and scarifier and the collection of refuse, for the urban district council.—Mr. L. C. Bowen, clerk, 34, Station-road, Chingford.

WEST SUFFOLK.—March 6th.—For the supply of broken material (tarred and untarred), for the county council.—Mr. T. W. Morgan, acting county surveyor, Shire Hall, Bury St. Edmunds.

STROOD.—March 7th.—For the supply of Guernsey granite spalls, broken Guernsey and other granites, quartzite, and basalt, Kentish rag, surface-picked and grubbed flints, local pit flints, and dehydrated tar, for the rural district council.—Mr. J. E. Povey, clerk, Council Offices, Stroud.

BLYTHING.—March 7th.—For the supply of 5,500 tons of granite, granite chips and flints, for the rural district council.—Mr. H. A. Mullens, clerk, Council Offices, Bulcamp, Halesworth.

PETERBOROUGH.—March 7th.—For the supply of gravel, granite and team labour, for the rural district council. Mr. W. B. Buckle, clerk, 49 Priestgate, Peterborough.

FLEET.—March 8th.—For the provision of horse and team for street watering, and the supply of 5,000 gallons of tar, for the urban district council.—The Surveyor, Council Offices, Fleet, Hants.

STAFFS.—March 8th.—For the supply of cartage, road materials, and tools, for the county council.—Mr. J. Moncur, county surveyor, County Buildings, Stafford.

TADCASTER.—March 8th.—For the supply of road material, stores and carting, for the rural district council.—Mr. T. Scott, surveyor, Aberford, Leeds.

EPPING.—March 8th.—For the supply of gravel and materials, for the rural district council.—Mr. F. Forrester, surveyor, Thornwood, near Epping.

CAISTOR.—March 8th.—For the supply of about 20,000 gallons of refined or distilled tar, for the rural district council.—Mr. A. A. Padley, clerk, Council Offices, Caistor.

BINGLEY.—March 9th.—For the supply of granite, tarred slag, tarred limestone, limestone, lime, pitch and oil, tar and sanitary pipes, for the urban district council.—Mr. H. Bottomley, engineer and surveyor, Town Hall, Bingley.

SEDGEFIELD.—March 9th.—For the supply of road metal, concrete kerbstones and flags, sanitary pipes, cartage and team labour, for the rural district council.—Mr. W. R. Plews, highway surveyor, 6 South-view, Ferryhill, Durham.

MORLEY.—March 9th.—For the supply of limestone, Portland cement and lime, earthenware pipes and gullies, brooms and brushes, pitch and creosote oil, flags, setts, kerbs, sand and iron castings, for the corporation.—Mr. F. Turner, borough engineer, Town Hall.

DURHAM.—March 9th.—For the supply of whinstone, slag, tar-macadam, and tar, for the rural district council.—Mr. G. Gregson, surveyor, 38 Saddler-street, Durham.

SEVENOAKS.—March 10th.—For the supply of granite quartz, basalt or other approved hardstone, team labour and cartage and haulage, for the rural district council.—Mr. F. H. Vibert, clerk, Bank Chambers, 82 High-street, Sevenoaks.

WILLINGTON.—March 10th.—For the supply of carting and horse hire, mason work, road metal, and scavenging, for the urban district council.—Mr. J. H. Gardner, surveyor, Willington, Durham.

DURHAM.—March 10th.—For the supply of broken whinstone, broken limestone, broken slag, rough slag, tarred slag, tarred limestone, distilled and prepared tar, tools, team labour, cartage, and sanitary pipes, for the county council.—Mr. A. E. Brookes, county surveyor, Shire Hall, Durham.

SHEPTON MALLET.—March 10th.—For cleansing the highways, street watering, steam rolling and scarifying, and the supply of road materials, for the urban district council.—The Acting Surveyor, Council Offices.

BUCKLOW.—March 12th.—For the supply of granite setts, grit setts, broken granite and slag, chippings, cinders, road grids, tools, and paving, for the rural district council.—Mr. R. Curtis Corden, highway surveyor, Knutsford, Cheshire.

LEAMINGTON.—March 12th.—For the supply of about 2,500 tons of paving-stone, for the corporation.—The road surveyor, Adelaide-road Depot, Leamington.

KNARESBOROUGH.—March 13th.—For the supply of whinstone, granite, annealed and ironstone slag, and tar, for the rural district council.—Mr. H. J. Halstead, highway surveyor, 14 Bower-road, Harrogate.

CARSHALTON.—March 13th.—For treating about 14,000 square yards of road with bituminous binder-preventing material, for the urban district council.—Mr. C. P. Lovelock, clerk, District Council Offices, The Square, Carshalton, Surrey.

CARSHALTON.—March 13th.—For the supply of [illegible] tons of 2½ in. and 400 tons of 1½ in., or 1,000 tons of mixed gauge cold-blast tarred slag macadam, of best quality, for the urban district council.—Mr. W. Gale, surveyor, District Council Offices, The Square, Carshalton, Surrey.

WALSALL.—March 13th.—For the supply of broken furnace slag, broken granite, and stoneware pipes, for the rural district council.—Mr. W. P. Young, district surveyor, Council Offices, Daw End, Rushall, Walsall.

AYLESBURY.—March 14th.—For the supply of clean hand-picked field flints, granite, furnace slag, Derbyshire limestone and refined tar, for the rural district council.—Mr. H. G. Cordon, highway surveyor, 21, Walton-street, Aylesbury.

HOLLINGBOURN.—March 14th.—For the supply of road materials, for the rural district council.—Mr. H. J. Bracher, clerk, 33 Earl-street, Maidstone.

ST. HELENS.—March 17th.—For the supply of macadam, granite chippings, limestone chippings, granite setts, kerbs, channels, grit setts, concrete flags, sand and tarred macadam, for the corporation.—Borough Engineer, Town Hall, St. Helens.

HORSHAM.—March 17th.—For the supply of flints, granite, granite chippings and sand, for the rural district council.—Mr. W. Dengate, surveyor, 58 Park-street, Horsham.

KIVETON PARK.—March 17th.—For the supply of broken slag, granite, and tar macadam, for the rural district council.—Mr. F. Hewitt, surveyor, council offices, Kiveton Park Station, near Sheffield.

EPSOM.—March 19th.—For the supply of granite chippings, dug flints, fine gravel, sand, stoneware pipes, and team labour, for the rural district council.—Mr. T. E. Ware, surveyor, Waterloo-road, Epsom.

ELY.—March 21st.—For the supply of 2,930 tons of granite and 1,050 tons of gravel, for the rural district council.—Mr. F. W. Firby, district surveyor, Sutton, Isle of Ely.

CHAILEY.—March 22nd.—For the supply of about 2,980 yds. of flints, 2,550 yds. of granite or other stone, and 60 yds. of gravel, for the rural district council.—Mr. C. Patrick, clerk, Union Offices, West-street, Lewes.

Sanitary.

NEWCASTLE-ON-TYNE.—March 5th.—For the removal of house refuse, for the corporation.—Acting City Engineer, Town Hall.

BEDLINGTON.—March 5th.—For the removal of the contents of privies and ashpits, for the urban district council.—Mr. J. E. Johnston, surveyor, Council Offices.

LLANDAFF AND DINAS POWIS.—March 7th.—For horsing scavenging wagons and removing house refuse, for the rural district council.—Mr. M. Warren, clerk, Park House, 20, Park-place, Cardiff.

HOWDEN.—March 8th.—For scavenging, for the rural district council.—Mr. H. Green, clerk, Howden.

WEST HAM.—March 8th.—For the supply of disinfectants, for the Education Committee. Town Clerk, 95, The Grove, Stratford.

ALNWICK.—March 12th.—For cleansing ashpits and carting ash-box refuse, for the rural district council.—Mr. H. W. Walton, clerk.

KEIGHLEY.—March 12th.—For emptying privies and ashpits, for the rural district council.—Mr. T. Burton, inspector of nuisances, Market Chambers, Keighley.

ST. MELLONS.—March 13th.—For scavenging in certain parishes, for the rural district council.—The Clerk, Union Offices, Queen's Hill, Newport, Mon.

FAREHAM.—March 13th.—For house scavenging and emptying cesspools, for the rural district council.—Mr. A. Laker, clerk, 97 West-street, Fareham.

CAERPHILLY.—March 20th.—For scavenging various districts, for the urban district council.—Mr. T. H. Richards, surveyor.

Stores.

BEDWELLTY.—March 5th.—For the supply of 2,400 tons of coal, 120 tons of white lime, limestone metalling and gravel, and basalt metalling and gravel, for the urban district council.—Mr. Dan H. Price, engineer and surveyor, Aberbargoed.

COLCHESTER.—March 7th.—For the supply of Derbyshire stone, lime, granite kerbing, granite setts, broken granite, Kettering iron slag, tar-macadam, broken Kentish ragstone, Kentish sifted red flints, Portland cement, glazed stoneware sewer

pipes, junctions, bends, traps, taper pipes and gullies, for the corporation.—Mr. H. Collins, borough engineer and surveyor, Town Hall, Colchester.

RICHMOND (Surrey).—March 7th.—For the supply of ironfounders' work, tools, ironmongery, forage, granite, granite siftings, broken chalk, brown pit flints, crushed shells, Thames ballast, gravel, granite kerb, channel and setts, York kerb and flagging, Portland cement and grey lime, artificial stone paving, harness and stable requisites, tar, tarred macadam (granite, slag, or limestone), wood blocks, oils and paints, for the corporation.—Mr. J. H. Brierley, borough surveyor, Town Hall, Richmond, Surrey.

EAST HAM.—March 9th.—For the supply of glazed stoneware pipes, glazed stoneware gully fittings (London make), stock and other bricks, Thames ballast, sand, coal and coke, broken granite, crushed granite, granite setts, Guernsey and other granite chippings, granite kerb and channelling, broken flints, cast-iron work, gullies, shovels, brooms, picks and handles, disinfectants, oilskins, hire of horses and carts, cartage of lime, uniforms, sewer ventilating columns, boots, sewer smocks, veterinary attendance, provender, reglazing and repair of street lamps, creosoted deal wood blocks, removal of timware from destructor works, and redressing of setts, for the corporation.—Mr. C. Eustace Wilson, town clerk, Town Hall, East Ham, E.

BUXTON.—March 10th.—For the supply of paving setts, flags, kerbs, Derbyshire basalt, macadam, tarred limestone, chippings and lump lime, Portland cement, earthenware pipes, disinfectants, castings (street ironwork), shovels, picks, ironmongery, brooms, brushes, pitch and refined tar, for the corporation.—Mr. F. Langley, borough engineer, Town Hall, Buxton.

DURHAM.—March 10th.—For the supply of broken whinstone, broken limestone, broken slag, rough slag, tarred slag, tarred limestone, distilled and prepared tar, tools, team labour and cartage, and sanitary pipes, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

DERBY.—March 12th.—For the supply of bricks, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar and slag, for the corporation.—Mr. John Ward, borough surveyor, Babington-lane, Derby.

LEEK.—March 12th.—For the supply of flags, kerbs, channels, setts, macadam stone and chippings, limestone and slag tar-macadam, Portland cement, sanitary pipes, pitch and oil, scavengers' bass brooms, cast-iron manhole and lamphole covers, galvanised malleable manhole step-irons, and cast-iron gullies and frames, for the urban district council.—Mr. W. E. Beacham, engineer and surveyor, Town Hall, Leek.

OLDHAM.—March 14th.—For the supply of granite setts, Rawtenstall setts, gritstone setts, Rawtenstall flags and kerbs, granite macadam, Portland cement, earthenware pipes, junctions and bends, cast-iron manhole and lamphole covers, gully grates, pitch and creosote oil, sand and gravel, timber, spades and shovels, for the corporation.—Borough Surveyor, Town Hall.

DARLINGTON.—March 15th.—For the supply of whinstone, limestone, slag, cement, lime, iron and steel ware, castings, brooms, brushes, disinfectants, oils, paints and refined tar.—The Borough Surveyor and Water Engineer, Town Hall.

BOURNEMOUTH.—March 15th—26th.—For the supply of road and sanitary materials, for the corporation.—Mr. F. P. Dolamore, borough surveyor, and the town clerk.

HEYWOOD.—March 17th.—For the supply of setts, kerbs (local stone), flags (local stone), earthenware pipes, bends, junctions, taper pipes, traps, gullies, pitch, creosote oil, limestone chippings (white), hand-broken granite and granite chippings, and Portland cement (British standard specification), for the corporation.—Mr. J. B. Nuttall, borough surveyor, Municipal Offices, Heywood.

SUTTON COLDFIELD.—March 19th.—For the supply of granite macadam, limestone, gravel and broken pebble stones, Yorkshire kerb, Rowley setts, earthenware pipes, cement and lime, iron castings, iron and steel, timber, hardware, oils and paints, and bass brooms, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor, Council House, Sutton Coldfield.

COVENTRY.—March 19th.—For the supply of broken roadstone, broken slag, granite kerbs, granite setts, stoneware pipes, castings and workmen's tools, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor, Council House, Coventry.

Miscellaneous.

BATTERSEA.—March 5th.—For the supply of good, strong, well-conditioned cart horses, from the 31st March next, the council to stable, shoe, and keep the horses, for the borough council.—Mr. W. Marcus Wilkins, town clerk, Town Hall, Battersea, S.W.

TEDDINGTON.—March 6th.—For the supply and planting of privet, Austrian pines, acacias, chestnut and other trees at the sewage disposal works, for the urban district council.—Mr. Marshall Hainsworth, surveyor, Public Offices, Teddington.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ADWICK-LE-STREET.—For scavenging and emptying privy middens, for the urban district council.—Mr. G. Gledhill, surveyor :—

G. G. Buckley, Carcroft, Doncaster, £975, plus 15 per cent during the war and one month after.

BEXHILL.—For the supply of distilled tar, Tarvia, or other compounds for use in tar-spraying, for the corporation.—Mr. T. E. Rogers, town clerk :—

	Per gallon.
Bristowe & Co., Limited, London, S.W.	5½d.
R. S. Clare & Co., Limited, Liverpool ..	4 7/16d
Gas Light and Coke Company, London, E.C. .	4·2d.
Manchester and Sheffield Tar Works Company, Sheffield .. .	3½d.
Rylance & Sons, Liverpool ..	2½d.
Grindley & Co., Limited, London, E.	5¾d.
Road Supply Company, London, S.W. ..	3 11 16d.
F. G. Holmes & Co., Northfleet	3¾d.
Forbes, Abbott & Lennard, Limited, Shoreham	3¾d.

SOUTHAM.—Accepted for the supply of about 3,000 tons of granite and 250 tons of best blue broken slag, for the rural district council.—Mr. H. Pickering, surveyor :—

2½-in. Granite.—Midland Quarry Company, Limited Nuneaton, 11s. 2d. to 13s. 8d. per ton; Judkins, Limited, Nuneaton, 11s. 2d. to 13s. 8d. per ton; C. Abell, Limited, Atherstone, 11s. 2d. to 13s. 8d. per ton.

2½-in. Slag.—J. Freakley & Co., Limited, Tipton, 6s. 9d. to 8s. 3d. per ton.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

3.—Institution of Municipal Engineers: Annual Meeting of Northern District, Newcastle-on-Tyne.

5.—Society of Engineers: Mr. A. W. C. Shelf on "High Tensile Steel *versus* Mild Steel for Reinforced Concrete." Burlington House, W., 5.30 p.m.

23.—Town Planning Institute: Mr. W. Rees Jeffreys on "Road Construction and Improvements by Means of Town Planning Schemes." 6 p.m.

31.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Spenborough.

APRIL.

7.—Institution of Municipal and County Engineers: Eastern Sub-District (Suffolk Norfolk, and Cambridge) Meeting at Beccles

APPOINTMENTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

THE CORPORATION OF BOLTON.
WATERWORKS DEPARTMENT.

Engineering Draughtsman wanted at once.

Must be ineligible for military service.

Apply, stating age, experience, salary required, and enclosing copies of recent testimonials—

LEWIS MITCHELL,
Waterworks Engineer.

Town Hall,
Bolton.
February 28, 1917. (3,340)

WANTED, at once, competent Engineering Assistant, conversant with Sewerage, Sewage Disposal, and Water Supplies. Apply, stating age, experience, salary required, and giving references, Willcox & Raikes, 63 Temple-row, Birmingham (3,331)

APPLICATIONS are invited for the Post of Municipal Engineer to the Municipality of Lahore, India.

The engagement to be for a period of five years on a monthly salary of Rs.1,250 (equivalent to £s.1,000 per annum) to Rs.2,000 (equivalent to £s.1,600 per annum), according to qualifications.

Applicants must have thorough experience of civil engineering, particularly of sewerage and water-works, as well as mechanical engineering, and should hold a diploma of some well-known college of engineering, and must not be under 30 or over 45 years of age.

Applications, which should be accompanied with certificates and references, and a full statement of experience and qualifications, should be sent, under registered cover, to the undersigned, to reach not later than 1st May, 1917.

A candidate selected in England will be given a first-class passage to Bombay and a first-class railway fare to Lahore.

(Signed) H. P. TOLLINGTON.
Deputy Commissioner and President.

... Municipal Committee,
... Lahore
... (3,335)

WANTED, Surveyor's Junior Assistant. Must have had Municipal experience. Salary £75 per annum. Apply, John ... and S. Crawshaw, Surveyor, Council Offices, Wednesbury, Staffs. (3,341)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH OF SUTTON-COLDFIELD.
ANNUAL CONTRACTS.

The Corporation are prepared to receive Tenders for the Supply of the following Materials during the year ending March 31st, 1918:—

1. Granite Macadam.
2. Limestone.
3. Gravel and Broken Pebble Stones.
4. Yorkshire Kerb.
5. Rowley Setts.
6. Earthenware Pipes.
7. Cement and Lime.
8. Iron Castings.
9. Iron and Steel.
10. Timber.
11. Hardware.
12. Oils and Paints (in small quantities only).
13. Bass Brooms.

Conditions of Contract and Forms of Tender may be obtained on application to the undersigned.

Sealed Tenders, on the Forms supplied, and endorsed "Tender for Materials," to be sent in to me not later than Monday, March 19th, 1917.

The Corporation do not bind themselves to accept the lowest or any Tender.

W. A. H. CLARRY,
Borough Engineer and Surveyor.

The Council House,
Sutton Coldfield.
March, 1917. (3,339)

ELY RURAL DISTRICT COUNCIL.
TO GRANITE AND GRAVEL MERCHANTS.

The Ely Rural District Council, at their meeting on the 22nd of March next, will be prepared to consider Tenders for 2,700 tons of Granite and 1,050 tons of Gravel. Forms of Tender may be had on application to Mr. F. W. Firby, District Surveyor, Sutton, Isle of Ely. Sealed Tenders, endorsed "Tender for Road Material," to be delivered to me on or before Wednesday, the 21st March next; but the Rural District Council do not pledge themselves to accept the lowest or any Tender.

Samples must be sent to the Workhouse, Ely.

By order,
E. B. CLAXTON,
Clerk.

Local Government Offices,
Ely.
February 27, 1917. (3,338)

EAST HAM CORPORATION.
ANNUAL SUPPLIES.

The East Ham Corporation invite Tenders for the after-mentioned Supplies and for executing the following Work, for—

(1) A period of 6 months, ending 30th September, 1917, and alternatively,
(2) A period of 12 months, ending 31st March, 1918:—

Glazed Stoneware Pipes.
Glazed Stoneware Gully Fittings (London Make).
Portland Cement.
Grey Stone, Chalk, and Blue Lias Lime.
Stock and other Bricks, &c.
Thames Ballast, Sand, &c.
Coal and Coke.
Broken Granite.
Crushed Granite.
Granite Setts.
Guernsey and other Granite Chippings.
Granite Kerb and Channelling.
Broken Flints.
Cast-iron Work, Gullies, &c.
Shovels, Brooms, Picks and Handles.
Disinfectants.
Oilskins.
Hire of Horses and Carts for Watering Streets.
Hire of Horses and Carts for General Cartages.
Hire of Horses and Carts for Scavenging.
Hire of Horses and Carts for Collection of House Refuse.
Cartage of Lime.
Uniforms for Firemen, &c.
Uniforms for ... Tramway Employees.
Sewer Ventilating ... Columns.
Boots, Sewer Smocks, W... &c.
Veterinary Attendance ... and Shoeing Horses.
Provender. ... 22nd.
Reglazing and Repair of ... yeet Lamps.
Creosoted Deal Wood Blocks. ...el.
Removal of Tinware from Destruc... Untor Works.
Redressing of Setts (Labour only).

Particulars and Forms of Tender may be obtained upon application at the Offices of the under... signed, or by forwarding an addressed envelope (foolsca... For... size), duly stamped.

The person or persons whose Tender is accep... Ac... ted will be required to observe and fulfil the obligation... upon Contractors specified in the Fair Wages Resolution adopted by the House of Commons on the 10th March, 1909, which is fully set forth in the Form of Tender, and to enter into a Contract with a Bond for the due performance thereof.

Tenders to be delivered addressed to His Worship the Mayor, Town Hall, East Ham, E., and endorsed according to the supply or work tendered for, not later than 12 o'clock noon of Friday, 9th March, 1917.

The Corporation does not bind itself to accept the lowest or any Tender.

(By order)
C. EUSTACE WILSON,
Town Clerk.

Town Hall,
East Ham, E.
February 21, 1917. (3,320)

CITY OF COVENTRY.
WATERWORKS STORES (CAST-IRON PIPES, LEAD PIPES, SOLDER, &c.).

The Waterworks and Fire Brigade Committee of the Corporation of the City of Coventry invite Tenders for the supply and delivery of Cast Iron Pipes, Lead Pipes, Solder, Hydrant and Valve Boxes, &c., for the year ending 31st March, 1918.

Form of Tender and full particulars may be obtained, and samples inspected, on application to the undersigned.

Tenders are to be delivered at the Water Engineer's Office, Council House, Coventry, on or before Monday, 12th March, 1917, sealed and endorsed "Tender for Waterworks Stores."

The lowest or any Tender will not necessarily be accepted, and no Tender will be considered which is not made out on the form supplied.

J. E. SWINDLEHURST,
Water Engineer.

Council House,
21st February, 1917. (3,329)

The Surveyor

And Municipal and County Engineer.

Vol. LI. MARCH 9, 1917. No. 1,312.

Minutes of Proceedings.

Summer Time. The recently issued report of the committee appointed by the Home Secretary to enquire into the social and economic results of the Summer Time Act, 1916, shows that upon the whole of the evidence received the vast preponderance of opinion throughout Great Britain is enthusiastically in favour of the scheme and of its renewal not only as a war measure, but as a permanent institution. As a result of their investigations, the committee therefore recommend that Summer Time should be reintroduced this year and in subsequent years. The enquiry conducted by the committee was of a comprehensive nature, and included the taking of evidence from most if not all of the interests affected. Two sections of the general summary of the evidence contained in the report are of special interest to our readers. We refer to those which deal respectively with public health and with economics in artificial light and fuel. With regard to public health, the conclusion, although satisfactory as far as it goes, is not very convincing. The abnormal conditions which prevailed last summer in themselves prevented any very definite evidence being offered as to the effects of the Act on the public health. Such evidence as the committee were able to collect, however, shows that, so far as the conditions permitted, the extra hour of daylight was generally used for the purpose of outdoor recreation and pursuits, and in particular for the cultivation of gardens and allotments. This being so, it is evident that during the present crisis in regard to food production the adoption of the Summer Time scheme this year is highly desirable. Apart from this, the general medical opinion, as communicated to the committee, is that the extra hour in the open air must have proved beneficial to the health of those who enjoyed it, although at the moment no particular facts and figures can be adduced in support of this statement. With regard to economies in artificial light and fuel, the committee were again unable to obtain such definite evidence as might have been available in the absence of other disturbing factors. The general result, however, appears to be that, as regards electric light, there was a reduction in consumption of something like 20 per cent for lighting purposes, while in regard to gas the reduction works out at about 9 per cent, so far as it can be estimated at all. The information, it is true, is not very precise, but it at least leads to the conclusion that the adoption of the principle of Summer Time last year resulted in a considerable saving in the national coal consumption. We need hardly say that for ourselves we cordially endorse the recommendation of the committee for the reintroduction of the measure.

* * *

Economy in Water Treatment. Every economy which is the result of careful thought and scientific work, as distinguished from wasteful systems or precedent, is welcome, and is, moreover, exactly what is wanted at the present time. It is therefore useful and interesting to hear of the substitution of iron for alluminium sulphate at the filtration plant at Clarksburg, Western Vancouver, waterworks, this having greatly reduced the war-time cost of coagulant. Mr. Perkins Boynton, the chemist in charge of the waterworks, has recently published a very interesting description of this process. The altered treatment is due to the greatly increased price of sulphate of alumina, which led to the trial of sulphate of iron and lime. The conclusions drawn from the first trial were that a clear, sparkling water could be obtained at all times with original turbidities varying from 10 to 1,500 parts, and later results obtained during six months' working have borne out the conclusion. Also the comparative costs of the two coagulants—viz., iron, including the use of lime all the time, and alum, using lime when necessary—were 85 and 813 per 1,000,000 gallons. Thus a great saving was effected. It should be noted, however, that the result of the constant application of lime has been that a greater quantity of hypochlorite is required in order to kill the bacillus coli in the filtered water, the quantity of hypochlorite of lime being increased from 5 lb. or 6 lb. to 8 lb. or 10 lb. per 1,000,000 gallons. It should be remembered that the cost of hypochlorite of lime has advanced considerably. The result is in agreement with the theory that a longer time is necessary for a given quantity of hypochlorite to act on a water free from carbonic acid gas than on one in which carbonic acid gas is present. The advanced prices of materials, and the various altered conditions produced by the war, eventually produce great increase of working costs, and when this occurs it is obviously necessary that the best scientific attention should be directed to the problem, and it will more often than not be found that an intelligent change of methods will produce economical results. Such troubles should be a spur to ingenuity, and if dealt with properly will lead to valuable discoveries and to the adoption of methods which will be of the greatest value long after the war conditions have passed away.

Water Waste. Apropos of the subject just referred to, the discussion of water losses in city systems at a recent meeting of the New England Waterworks Association suggests that greater attention might be given to the matter. The casual way in which American engineers refer to leakages and waste is a matter for surprise to the English water engineer, for there are very many places in this country where great attention is given to economy of fuel at the pumping station, and where the leaking condition of the mains and house services is practically ignored. It is said that about 50 per cent. of the water supplied to the population of the United States by the water authorities is wasted, and the cost of this water is estimated at over £5,000,000 per annum. If a similar calculation were made for this country the result would be interesting. When it is remembered that in a great many cases this waste water must be pumped up as sewage, the cost of waste and leakage—for leakage is apt to find its way into sewers—is clearly no small matter. The fact that house service pipes have not an unlimited life is completely overlooked. Iron pipe services over a certain age ought to be relaid. Even in London a house cistern may overflow for months or years, and a service pipe, or a series of service pipes, may leak for an indefinite time without discovery and without proper steps being taken for discovery. Means are at hand for checking such leakages, and the contention that mains cannot be made tight is inadmissible. The value of work done in producing a watertight system and in maintaining it is not yet properly recognised.

Linking-up Electricity Undertakings. Not before it was needed steps are being taken officially to encourage the linking-up of municipal electricity undertakings in the country. Steps have already been taken voluntarily in certain London boroughs to attain this end, with results that have yet to be recorded, but there is little doubt that with proper management these will in the end be satisfactory. Now we have to welcome the intervention of the Board of Trade in the matter, and, though this intervention would seem to be more moral than actual, it has been received with acceptance by a large number of municipal authorities in the Midlands. Mr. G. H. Roberts, M.P., Parliamentary Secretary to the Board, took the chair last week at a conference held at Manchester of delegates from the municipal electrical undertakings in Lancashire and Cheshire with a view to setting in motion a scheme for linking-up the various works. The proposal, he explained, was a war-time measure, and economy with the generating of the industrial supply of electricity was the essence of the scheme. That it should require a war-time crisis to bring home to our minds the necessity for what ought to be an every-day desideratum is characteristic of many phases of our commercialism. This point need not be laboured now, however. What really matters is that evidence was forthcoming of the substantial benefits to be derived from the proposals made. The electrical engineer of the Manchester Corporation, Mr. S. L. Pearce, showed from a report prepared by a committee of which he is chairman that with coal at 17s. 6d. per ton there would be an annual saving on coal alone in respect of four groups of £82,000 a year, and that figure could be materially increased. The scheme of which a general outline was given, received the formal approval of the delegates, and the details, including the setting up of a joint board, will be arranged in conference with the municipal undertakings and the Board of Trade. It aims at the removal of that enormous waste of labour and material which was so general before the war by means of a system of co-operation and co-ordination which it is to be hoped may become universal in our industrial life before long.

* * *

A Proposed Wheel Tax. Traffic arising directly, or indirectly, out of the war has caused such a strain upon the roads of the country, and the shortage of labour has rendered it so difficult to maintain them in a state of efficiency, that it is evident that at the end of the war some drastic steps will have to be taken to prevent their ruin. This will, of course, involve the raising, in one way or another, of a vast sum of money. The matter has been under consideration by the Association of British Motor and Allied Manufacturers, Limited, and they have put forward a number of proposals on the subject. They do not favour any heavy taxation of road users, either by means of a petrol tax, licence duties, or other methods. Their contention is that taxes of this kind not only tell against the market interests of the motor industry, but by penalising transport handicap all industry and prosperity. We cannot at the moment go into the merits of this argument, and we merely repeat it because it leads to a proposal which cannot but be of interest to our readers. This proposal is no other than that a wheel tax should be imposed on all road users in respect, not only of motor vehicles, but also those that are horse-drawn. It is suggested that the tax might be fairly graduated according to the weight of the vehicle and its motive power. Again, it is proposed that the proceeds of tax should not be treated as principal money for immediate expenditure, but that it should be used in the payment of interest on a road loan of £20,000,000 or £30,000,000. When it is suggested, however, that the loans should be used for the purpose of remaking roads for motor transport, it is at once seen that the imposition of the suggested tax would be strenuously opposed by the users of horse-drawn vehicles, who would in effect be called upon to pay a substantial contribution towards the cost of work which would be admittedly undertaken for the exclusive benefit of motor traffic. The proposal as set forward, however, is of so bold and novel a character that we shall be interested to learn the views on the subject of the proposed tax of those who look at the question, not from the point of view of road users, but rather as highway engineers.

* * *

National Service. Although Mr. Neville Chamberlain's scheme for National Service is making good headway, it appears from the speeches that he is making that a good deal more remains to be done before he will be satisfied with the result. Some doubt has been expressed in certain quarters as to whether it is desirable for those who are already doing work of national importance to enrol themselves as National Service volunteers. To this question Mr. Chamberlain returns an affirmative answer, and in our opinion rightly so. The principal value of a Director-General of National Service is to act as a judge as to whether individuals are or are not doing the best work possible in the public interest in present occupations. But unless everybody enrols as a National Service volunteer, no matter what work they may be doing now, the decision as to whether their present work is of national importance or not will be removed from the Director-General to the individual. The question is one which directly affects the officials of local authorities, and a circular on the subject has just been issued by the Local Government Board. This circular points out that officials ought to enrol as volunteers, and gives an assurance that they will not be called up for service without an opportunity being given to appeal against their removal on

the ground that they are already doing work of national importance. The result is that the fact of the officials of a local authority being enrolled will not entail any disturbance of the work of the authority unless it should be in the national interest to transfer individuals elsewhere, and in such cases the authority would be consulted, and in the exceptional circumstances would probably give their consent. The duty of local authorities and of officials under the scheme is therefore clear, and we are confident that as good a response to the appeal that has been made will be forthcoming from local government officials as from any other class of the community.

* * *

Refuse Removal in St. Pancras.

Many local authorities have experienced difficulty in providing adequately for the service of the removal of house refuse, in view of the taking of labour for military service. Happily, however, in few districts has the trouble become so acute as it has in St. Pancras. In that borough the service has been most seriously crippled, principally owing to the fact that stokers have been taken by the Army authorities from the refuse destructor, and that it has, of course, been found impossible to replace them by women, owing to the strenuous nature of their duties. Every effort has been made to replace these men, but the result has only been to secure fifteen instead of a normal staff of twenty-seven, which means that the destructor has been able to burn only about 70 tons a day instead of the normal minimum of 150 tons. Unfortunately, there is in St. Pancras no storage place for the refuse, although it has been suggested that it might be placed in the public gardens. This course, however, has quite rightly not been adopted, and if it had there must have been serious danger to the public health. It now appears that the difficulty has partly been overcome by an arrangement made with the Midland Railway Company to remove the refuse for deposit to a large open space at Gospel Oak under conditions which will not be at all deleterious to the immediate neighbourhood. We understand that in securing this accommodation the borough council have received considerable assistance from the Local Government Board, and it is at least encouraging to find that that department is alive to the importance of taking every possible step to maintain in a state of efficiency the public health service of the country.

* * *

An Important Appeal.

On Monday last judgment was given in the Court of Appeal in the case of the *Metropolitan Water Board* v. *Dick, Kerr & Co., Limited*. The appeal was from a judgment of Mr. Justice Bray, which has already been noted in these columns. We may, however, remind our readers that the action arose out of a contract to construct two reservoirs at Littleton, Middlesex, which the defendants had agreed to construct for £673,000. The substantial question in the case arose out of the action of the Ministry of Munitions, who, in exercise of their powers under the Defence of the Realm Act and Regulations, had required the defendants forthwith to cease work on the contract. The defendants contended that, by reason of this action of the Ministry, the further performance by them of their part of the contract had become impossible and illegal, and that in consequence the contract was at an end. Mr. Justice Bray held that on the true construction of the contract the intention of the parties was to enable the plaintiff's engineer to extend the time for performance to every possible event which might delay the completion of the contract, including the intervention of the Ministry of Munitions, and that the contract had not in fact been frustrated or its completion rendered physically impossible or commercially impracticable. In the Court of Appeal, however, this decision was overruled, and it was held that in the events that had happened the contract was dissolved, and the court made a declaration to that effect and discharged the injunction which had been granted by Mr. Justice Bray restraining the defendants from removing the plant remaining on the site.

* * *

Contracts During the War.

There are probably few, if any, local authorities that have not had appeals made to them by contractors for a revision of the terms of contracts owing to hardship created by the prevalent war conditions. Pleas of this kind from contractors have placed local authorities and officials in a rather difficult position, for whereas, on the one hand, they have realised the hardship of holding contractors to their bargains, they have, on the other hand, felt difficulty in releasing them because of a realisation that they are dealing practically as trustees with the money of the ratepayers. The introduction into the House of Commons of a Bill to meet this difficulty will therefore be received with some relief. We refer to the new Courts Emergency Powers Bill, which was recently introduced by the Solicitor-General. The first part of the Bill deals with contracts and particularly with the legal position of contractors, who before the war entered into contracts for the construction of buildings and found that, by reason of circumstances attributable to the war, it was impossible for them, without serious hardship, to perform their contracts within the stipulated time. In circumstances like these the Bill proposes to empower the court in proper cases either to suspend or annul the contract, provided that the court is satisfied that the performance of the contract is prevented or rendered gravely onerous by difficulties due to the war, either in regard to labour or materials. The Bill has been read a second time, and the principle having thus been accepted, no doubt it will become an Act in due course.

* * *

Restricted Lighting and Street Accidents.

In the comments which we made upon the inauguration of what has come to be known as the "Safety First" Campaign, we ventured to express the opinion that the great increase in the number of street accidents in the Metropolis was not attributable to the restricted lighting of the streets so much as to excessive speed and careless driving of motor vehicles. This view is borne out by the answer which was given by the Home Secretary to a question recently asked in the House of Commons as to the possibility of increasing street lighting in order to avoid accidents. Sir George Cave then stated that he could not agree that the increase in the number of fatal accidents was wholly or mainly due to the darkening of the streets, and in answer to a supplementary question he suggested that it might be due to the lack of experience of drivers and to too rapid driving. The attempt to attribute the increase chiefly to reduced lighting can hardly be justified in view of the ascertained fact that the number of accidents during daylight has increased almost in exactly the same proportion as the number during the hours of darkness. It is nevertheless satisfactory to know, as the Home Secretary stated, that the subject of street lighting has been considered in consultation with the military authorities and representatives of local authorities, and that, as a result, some modification may be looked for in the obscuring of public lamps, thereby ensuring some improvement in the diffusion of light in the streets.

Brushwood as a Medium for Sewage Filters.

[In an interesting article in the "Canadian Engineer," of Toronto, Mr. George Phelps, A.M.CAN.SOC.C.E., engineer in charge of the North Toronto Sewers and Disposal Works, gives the results obtained from experiments with brushwood and slag as filter media. The brushwood filter described, which is stated to have been a decided success, is virtually the outcome of the experiments with the lath filter originated by Lieut.-Colonel G. G. Nasmith, C.M.G., Director of Laboratories, Department of Public Health, Toronto, of which an account was given in "The Surveyor" of January 5th last.]

The sewage of North Toronto is treated in disposal works constructed prior to the amalgamation of that district with the city of Toronto; it is a domestic sewage, with practically no trade wastes, roof water being admitted to the sewers, but no other surface drainage.

In the early part of 1914 it was found necessary to clean out and refill some of the filters, and as an experiment it was decided to use brushwood as a medium in one case, and for a second filter, screened, washed and graded slag, so that the two could be run under similar conditions and a fair comparison made between the results obtained. The depth of the medium in each case was 5 ft. 6 in., both filters being 50 ft. in diameter, and roofed over. The distributors are of the Adams rotary type. Before reaching the filters, the sewage passes through a coarse screen, detritus tanks and sedimentation tanks, the retention period in the tanks averaging about three hours.

The brushwood filter was started on June 3, 1914, at an average rate of flow of two million gallons per acre per day, and has been run continuously at varying rates up to the present time, with only a few short stoppages for alterations to the plant, the longest stop being for three days. There is a continuous and fairly constant flow to the filter, the maximum and minimum rate for any day being about 10 per cent above and below the average.

After two months' working, the brushwood had become thickly coated with grey slime, and a very satisfactory effluent was obtained, and from that time on the flow to the filter has been periodically increased up to the present average rate of 7,250,000 gallons per acre per day.

The sewage passes through the filter at the present rate as freely as when it was first started. The coating of slime on the brushwood is in a condition of stability where it appears neither to increase nor diminish, and, as there is no sign of clogging, Mr. Phelps thinks it probable that the flow may yet be somewhat increased. The most noticeable change which took place was the shrinking of the brushwood, which in a few months settled down until the depth of medium was only about 4 ft. 6 in. This shrinking apparently stopped after about 18 months' working, and the brushwood shows no signs as yet of rotting or breaking down.

The slag filter, which has been kept under observation alongside the brushwood, is filled with washed and screened steel slag, graded as follows:—Bottom, 1 ft. of 3-in. to 5-in. slag; middle, 3 ft. of 1½-in. to 3-in. slag; top, 1 ft. 6 in. of ¾-in. to 1¼-in. slag.

It was started at a rate of 1½ million gallons per acre per day, and worked up to 2½ millions in six months; the rate was increased for a short time to three millions, but this resulted in clogging and ponding on the surface, and the rate had consequently to be reduced. The effluent from this filter has always been satisfactory, but its capacity is limited to about two million gallons per acre per day, the rate at which the sewage will pass through without clogging.

The effluent from both filters contains usually from 1 to 2 cubic centimetre of sediment per litre; this is a fine humus which is settled out by a half-hour retention in tanks; it is liable to increase with sudden rushes of storm water, but is easily got rid of.

Samples of sewage and effluents have been taken regularly five days in the week, until three months ago, since when samples have been taken on only two days in the week. These are always taken between 10 a.m. and 12 noon about the time of maximum flow. Analyses are made in the laboratory of the Medical Health Department of the city, and the following tables give the average results obtained, viz.:—

January to December, 1915.

	Free Amm.	Alb. amm.	Putrescibility.	Nitrates.
Tank effluent ...	12·83	2·83	22	—
Brush filter effluent ...	19·79	1·82	95·7	—
Slag filter effluent ...	14·1	1·69	96·4	—

December, 1915, to May, 1916.

	Free Amm.	Alb. amm.	Putrescibility.	Nitrates.
Raw sewage ...	12·50	3·84	—	2·36
Tank effluent ...	11·45	3·06	32	2·50
Brush filter effluent ...	10·59	1·56	90	2·55
Slag filter element ...	5·37	1·51	98	6·00

May to November, 1916.

	Free amm.	Alb. amm.	Putrescibility.	Nitrates.
Raw sewage ...	27·6	7·92	—	—
Tank effluent ...	22·3	3·94	35	—
Brush filter effluent ...	16·9	2·41	99·7	—
Slag filter effluent ...	11·4	2·20	100	—

The methylene blue test is used for putrescibility, and value 100 equals stability for 10 days.

The filter effluents are settled for one half-hour before analysis.

"Although the sewage," says Mr. Phelps, "is getting stronger in character, as shown by the average results for the last six-monthly period, the effluent from the brushwood filter is more stable than it previously has been, and the rate of flow at the same time is greater. This seems to indicate that the filter has not yet reached the limit of its capacity. The only tests for nitrates were taken during March and April, 1916. The average results given in the table go to show that nitrates are not formed in the brushwood as readily as in the slag filter, which is no doubt due to the rapidity with which the sewage passes through the brushwood. Unfortunately, this period included the time of the spring thaw, and the sewage was very much diluted. The filter was also taking considerably over 7,000,000 gallons per acre per day for practically the whole of the two months, so that further tests are necessary before a definite opinion can be formed on this point."

Mr. Phelps proceeds to describe the method of making and placing the brushwood mattresses in the filter. The floor of the filter is formed with a slope each way to the underdrains. The brushwood is placed in the filter in the form of mattresses of two cubic yards each. These were made by filling the brush into a wooden box of the required shape, and pressing it down with a follower on a long lever. The mattresses were wired up whilst under a pressure of about 80 lb. per square foot, and after this was released the shape was retained and they were easily handled. Witch hazel was found to be the best material for making up, but Mr. Phelps states that almost any kind of brush is suitable, provided no dead wood is used. It requires to be cut in the autumn or early spring, when no leaves are on. The cost of cutting, bundling, hauling about half a mile and placing the brushwood in the filter was much below that for which any ordinary medium could be obtained.

The results have been so satisfactory that brushwood as a medium is being used generally at the North Toronto plants when any filter needs refilling. The open nature of the brush, the writer of the article points out, allows good aëration, and it is very efficient when working at a high rate of flow. The rotary distributor also seems well adapted for this type of filter. It gives a good distribution, does not require a great deal of attention, and requires only about a foot of head for its operation.

"For small installations," Mr. Phelps continues, "particularly where operating charges are of great importance, it may be a long time before the activated sludge process, with the introduction of power that it entails, can compare favourably in cost of construction and maintenance with a plant consisting of sedimentation tanks and brushwood filters. Furthermore, an examination of the two processes will show that they are not so different in principle as at first sight they appear to be.

"The activated sludge process by the mechanical aëration of sewage induces the growth of organisms on particles of sludge, and by a mixing process brings these sludge particles into contact with all parts of the sewage, so accomplishing the process of oxidation and nitrification. The percolating filter accomplishes the same purpose by the reverse process, the organisms being stationary on the medium of the filter,

and the sewage brought into contact by trickling over the gelatinous substance in which they are contained.

"Most recent methods of sewage disposal show that the three main conditions necessary for the effective purification of sewage are: Sufficient aëration, a suitable medium for the growth of nitrifying organisms, which must be brought into intimate contact with all parts of the sewage, and the maintenance of the sewage at a moderate temperature. In the activated sludge process the introduction of the necessary power and machinery for air compressing adds very much to the operating costs, and any process which would automatically maintain the required conditions would naturally recommend itself, provided that the results were satisfactory. The above experiment has shown that the brushwood filter maintains fairly well the conditions set out above, without the introduction of power. Constructed with a good system of underdrains and with a space between the walls of the filter and the brushwood mattresses, the air has very free circulation throughout. The brushwood does not get compacted or lose its spring, but keeps quite open, and given proper ventilation, with the falling of a large volume of sewage through the filter, the air contained is constantly being changed.

"Brushwood also shows itself to be particularly suitable as a medium for inducing the slimy growth characteristic of sewage filters. The thick coating of this slime over every particle of the brush is in marked contrast to anything that can be seen on a medium such as stone or slag. Regarding temperature, it should be noted that the sewage at the experimental plant does not fall below 40 deg. Fahr. in the winter, and rises to a maximum of 58 deg. Fahr. in the summer; and, as the tanks and filters are all covered, the effluent leaves the plant at about the same temperature as the sewage enters. The temperature of the air at 4 ft. above the surface of the filter is noted every day, and only occasionally in the coldest weather does it fall as low as 36 deg. Fahr. The temperature of the filter medium can be taken as that of the sewage itself—that is, usually ranging between 40 deg. and 50 deg. Fahr., a favourable working temperature which has probably an important bearing on the efficiency of the filter.

"To engineers constructing filters of this type it is recommended that they be made at least 7 ft. deep, if possible, and made up to this depth again when the bed has been in work for twelve or eighteen months, in which time it will have shrunk down considerably. Nothing has been added to the one described since it was started, not because it is inadvisable, but because it would break the continuity of the experiment. A deeper filter would give the sewage a longer time in contact with the medium, and should give better nitrification. A 7-ft. deep filter could probably be worked efficiently up to 8,000,000 or 9,000,000 gallons per acre per day."

Mr. Phelps is of the opinion that a brushwood filter would satisfactorily treat raw sewage after passing through a coarse screen and detritus tank, without a preliminary treatment in sedimentation tanks at something approaching the rate of working obtained in the above plant, provided that the effluent were passed through a suitable humus tank, and it is hoped to be able to continue the experiment along these lines. Such a filter, he remarks, might be constructed on a coarse grating over a two-storey tank having a deep sludge digestion chamber, free air space being allowed all round, under and above the filter, the sewage falling through the filter directly into the tank. After sewage has been aërated the suspended solids quickly settle out, and a retention period of one half-hour in the tank should be sufficient to give an effluent fairly free of suspended matter. The sludge and humus would be collected in the same digestion chamber, and might be drawn off under hydraulic head in the manner usual with two-storey tanks.

In a concluding note Mr. Phelps says: "The principle of treatment of sewage in sedimentation tanks followed by percolating filters has been criticised on the ground that during its passage through the sewers aerobic bacteria are developed in the sewage and the process which is started there is reversed in the sedimentation tanks, where anaërobic bacteria are developed, to be reversed again in passing through the filters, which is a distinctly aërobic process. The part played by aërobic bacteria in the sewers is open to question, but there is no doubt that the treatment of sewage by filtration after it has passed through sedimentation tanks is a change over from the anaërobic to the aerobic process. A method which would eliminate the first sedimentation tank as here suggested would not be open to this objection, and the removal of what is apparently a check in the process might help towards the attainment of good results."

OFFICIALS AND NATIONAL SERVICE.

CIRCULAR TO LOCAL AUTHORITIES.

The following circular has been addressed to the clerks of local authorities by the Secretary of the Local Government Board:—

"I am directed by the President of the Local Government Board to state that he has received a number of applications from local authorities enquiring whether their officials should enrol as volunteers under the National Service scheme. Lord Rhondda has been in communication with the Director-General of National Service on the subject, and he is assured by him that no volunteer will be called up for service without an opportunity being given to his employer to appeal against his removal on the ground that he is already doing work of national importance, and further that the fact of the officials of a local authority being enrolled will not entail any disturbance of the work of the authority unless it should be in the national interest to transfer individuals elsewhere, and that in such cases the authority will be consulted. The Director-General fully realises that the administrative work of local authorities, in particular that which is required for maintaining the public health and public assistance, must continue. In these circumstances Lord Rhondda hopes that every encouragement will be given to the employees of local authorities to fill up the forms of offers of service."

"CUTELINE."

Now that the meaning of a series of single-letter pages in recent issues is announced, our readers will be interested to learn something of what "Cuteline" really is.

This material is the result of long experience in the fight against water and general corrosion, and the success achieved by the inventor in respect to plastic cements had led him on to further discoveries.

Plastic Cements and Fibrastic, Limited, are well known for their quick-setting and non-setting plastic cements, both of which materials they claim absolutely resist water in their respective methods of application.

Experiments made in this direction revealed the fact that the general surface of the material used was preserved, but a plastic cement not being a convenient form of application for a general surface treatment, further trials were made, which resulted in the perfection of Cuteline.

The chief difference lies in the fact that whereas a plastic cement, whether quick-setting or non-setting, is generally wanted in a position where pressure is required, Cuteline is applied to the surface of any material, in any position, under any conditions, as a reliable preservative.

We have seen concrete tanks which before the Cuteline was applied would not hold water for more than a few hours, but when coated on the inside with Cuteline, water, paraffin, and acid solutions remain, and show no sign of percolation whatever after months of standing. The same thing applies to any other material used in the construction of buildings, &c., whether wood, iron, steel, concrete, brickwork or stone—Cuteline makes them thoroughly waterproof.

The uses to which Cuteline may be applied appear to us almost endless, and if our readers desire any further information, we cannot do better than refer them to Mr. James Robbins, of Plastic Cements and Fibrastic, Limited, who will be only too pleased to show them his product and results in his comfortable office, at 11, Tothill-street, Westminster, S.W.

After-War Works at Broadstairs. — Broadstairs Town Council has been asked by the Local Government Board to make a formal application for sanction to a loan for work which it wishes to put in hand on the termination of the war. The council proposes to drain a new area of the district at a probable cost of £50,000.

The Testing of Materials.*

By P. C. COWAN, D.SC., M.INST.C.E.

The application of regular tests to materials is of comparatively recent origin. In an excellent encyclopædia published in 1859 the only definition of tests is that they are substances used by chemists in analyses. Until less than a hundred years ago, materials and the structures composed of them by man were comparatively simple. Stone, bricks, timber, lime, wrought iron and a few other metals sufficed, though the valuable properties of alloys and the means of hardening iron were known to the ancients. The invention of the steam engine, however, with its great effects in facilitating mechanical operations and transport, and the discovery of methods for the production of steel in great quantities, changed the whole situation, and introduced a countless number of problems which require the careful testing of materials.

Actual experience, both of success and failure, gained in a long period of time, affords the best means of judging the qualities of a material or a structure; but we cannot always wait for such experience. Engineers are constantly called upon to apply new material to new needs, with the limiting conditions that there shall be no failure and no unnecessary expenditure. Hence arises the practical need for testing materials, so that the engineer may justly proportion the dimension of parts of machinery or structures.

Testing is, of course, also of the greatest importance to the manufacturer, as, by skilful observation of the results obtained from different proportions in a composite material, or from different treatment of the same ingredients, he is enabled to improve his results, and to supply materials specially fitted for their purpose at a minimum cost. Tests fairly applied are also of great importance to the merchant and to his customers. They ensure that honest value shall be given, and prevent unscrupulous undercutting of prices and adulteration.

TESTING LABORATORIES.

The great value of testing laboratories has been recognised for many years, but was first insisted upon with convincing effect in the British Islands by Prof. (now Sir Alexander) Kennedy, on whose advice such a laboratory was started at University College in 1878. Now many of our colleges have similar departments, in which students obtain the most valuable kind of training. Valuable research work is also done in them by professors and their advanced pupils. We can gain knowledge in various ways—by reading, and by listening to lectures, and by seeing things done; but best of all, by doing things ourselves. That which we read, or hear of, or even see, is much more likely to escape our memory than that which we have done.

I am glad to say that very good teaching and research work is carried on in the laboratories at Trinity College, Dublin, and in the Technical Institute, Belfast, which is now most happily linked to the Queen's University in that city. Good laboratory work is also being done in the University Colleges of Dublin, Cork, and Galway. A fine mechanical laboratory has been equipped in the Royal College of Science, Dublin, and will doubtless prove of great value, especially if, as is likely, close co-operation is secured between the College of Science and the new University College, Dublin.

The high esteem in which such work is held by those most competent to judge of its value is proved by the fact that Dr. Unwin, who has, with brilliant success, devoted many years of his life to the study and exposition of the properties of materials, was, a few years ago, president of the Institution of Civil Engineers, which is probably the most powerful learned society in the world.

The late Sir Benjamin Baker, who was an ideal engineer, said in 1887 it had often come under his notice that a man whose mathematical training and whose training in a workshop has been all that could be wished, had designed a structure which failed from an apparently insignificant oversight in some small detail, which would not have occurred had the designer acquired the habit in an engineering laboratory of looking upon every detail of the work as a possible test-piece, the strength of which must be determined by calculation and verified by experiment. A man might have fifty years' practical experience and be deficient in qualifications with which a year's work in an engineering laboratory would have endowed him. He had seen practical men contentedly wedging up a line of continuous girders at the piers to get them true to the eye, when an error of 1 in. in 100 ft. meant an increased stress of 8 tons per square inch. A student who had measured the reaction of model continuous girders would as soon have contemplated manslaughter. Dozens of failures occurred with pumping machinery because the experienced practical men who designed it had not a clear realisation of the consequences of momentum, fluid friction, and other points which were impressed upon students by laboratory experiments.

The true aim is to make the engineer practical from the foundation, and to stamp out the indolent habit of resting content with a speculation, when the absolute truth can be elicited by experiment. This habit was too characteristic of the last generation of engineers, and if things had greatly improved now, the good result was largely due to the establishment of engineering laboratories. Yet only in 1902, when the National Physical Laboratory was founded at Bushy Park, did the Government begin to aid scientific research. This institution has done much invaluable work for the Empire, though it has hitherto received comparatively trifling financial aid from the State. For the first five years it received a grant of £4,000 a year, and now receives about £17,000 a year, of which the greater part is for aeronautical research. The United States Government give the American Bureau of Standards about £100,000 a year.

ENGINEERING STANDARDS COMMITTEE'S WORK.

Very important work has been done during the last sixteen years by the British Engineering Standards Committee, which was formed in 1901 at the instance of Sir John Wolfe Barry, past-president of the Institution of Civil Engineers.

The committee has received moderate but substantial aid from the Home, Indian, and Australian Governments, and has been supported by the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Naval Architects, the Institution of Electrical Engineers, and the Iron and Steel Institute. The committee was most fortunate in the election of Mr. Leslie S. Robertson, M.INST.C.E., as their secretary, and his loss in H.M.S. "Hampshire" was most widely and deeply regretted.

Nearly 100 reports have been issued specifying in a standard manner engineering materials and products, from locomotive engines for Indian railways to electrical cooking apparatus; from steel and iron for ships, railways, boilers, and motor cars to salt-glazed pipes, cement, coal, and road metal. To avoid stereotyping present practice and checking progress, the reports are revised from time to time, the need for such revision of each report being specially considered at least once a year. The expenses of the committee are largely met by subscriptions from manufacturing firms, railway companies, and public authorities, and from the sale of reports. It is most desirable that the price of these reports should be reduced, but that can only be done if additional contributions are secured. The way in which the reports of the committee are framed is satisfactory and practical. A sectional committee, including engineers, experts in connection with the special subject under consideration, and a number of the principal manufacturers concerned, is formed to deal with each report. This constitution of the committee is found to be very effective in preventing the adoption of extreme views regarding what is desirable from the engineer's point of view, or, on the contrary, what best suits the manufacturers, and secures in great measure satisfactory results both as to quality and cost.

The adoption of the British standard specifications is quite voluntary, but they are rapidly passing into very general use at home, in India, and in the Colonies, and will probably ere long form the basis for many foreign orders to our manufacturers, especially if the specifications are translated into the various principal languages, with the necessary conversion of measurements.

One of the most recent standard specifications prepared is for the sizes of broken stone and chippings, and it is adopted by the Road Board in relation to its grants for road improvements.

The immense importance of the standardisation of

* Extracts from presidential address to the Engineering and Scientific Association of Ireland.

methods and products is now widely known. The wonderfully low cost and high efficiency of the Ford motor cars and American and Swiss watches depend largely on standardisation of parts; and the vitally important speeding up of the Allies' supplies of munitions was only possible on account of the standardisation of parts and the adoption of a thorough system of gauging to secure the accurate finish of component parts.

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάνθ' ὁρᾷ

(One man does not see everything.)
—EURIPIDES.

THE CIVIC SURVEY OF S.E. LANCASHIRE.

To the Editor of THE SURVEYOR.

SIR,—Professor Abercrombie says that I am "frankly hostile to the Civic Survey, treat it unfairly, and endeavour to call up the evil passions of professional men by trying to put architects against surveyors"; but I do not admit that this view is correct, or comes with a very good grace from the Professor, judging by the tone of his letter in your last issue.

A civic survey carried out on right lines should be extremely useful in most cases, and it is only because it has not been carried out on right lines that this survey has met with any criticism. The hon. director of this survey is too experienced a journalist to expect to escape criticism, especially after inviting it, and I do not think he has shown his usual tact in questioning the somewhat mild criticism made in your annual issue.

The feeling between the two professions arises from the systematic attempt to belittle the municipal engineer which is made by the architectural press and profession, and because municipal engineers do not submit quietly to the alternate scoldings and patronage which they receive from architects, and resent the attempts to teach them the rudiments of their profession, they are accused of stirring up strife and evil passions. If architects would only remember the homely old saw about teaching one's grandmother how to extract the contents of eggs they would not butt in so often to teach surveyors how to lay out or make roads.

The Professor's defence of the traffic plan is neither ingenious nor ingenuous, and I cannot pretend to see the point of his reference to the encyclopædia and parish pump, or to understand his very mixed metaphor about the "elixir of the road problem." All that I know is that the plan set out to give a graphic representation of the traffic on the roads in the Manchester district, and that the data was so inadequate, and based on so short a time, that it was quite useless for the purpose for which it was intended. If the plan had given a full and correct record of the traffic on these roads, I can hardly imagine any surveyor foolish enough to carry out the Professor's suggestion of putting a fence down the middle of the road; but the suggestion of the gentleman who called attention to the lop-sided traffic shown on the plan, that it might be necessary to remove the tram rails from the centre of the road so as to accommodate the lop-sided traffic, was one that had much to recommend it.

The idea of traffic plans for large areas is, as I have said previously, admirable, and it was with the view of preparing such plans, and for the classification of the roads by the Road Board, that the census of traffic was undertaken in 1914 by our county and other local authorities. In the hands of men who understood their requirements such plans would have been found very useful, but when they passed into the hands of amateur road engineers and budding artists, they could not be expected to be found satisfactory. Professor Adshead is to be allowed to make sweeping reflections on the ability of surveyors to prepare housing schemes, but when surveyors with much greater reason object to architects lecturing them on the laying-out and making of roads, they are told that they are stirring up evil passions, and are unfair. I may have been mistaken in imagining that the large-scale contour and rainfall plan was intended to assist water engineers; but I certainly gathered that was the intention from the statements made at the Exhibition meeting. The scale, too, may be wrong, and it was possibly only a sketch plan, with no pretentions to accuracy either of scale or levels, for I can hardly understand how it was possible for a body of men unfit to revise an ordnance plan being able to do the levelling required for a reliable contour plan.

One need not necessarily be colour-blind because one is unable to distinguish readily twenty or more different tones of colour on a single plan, but I think I am entitled to suggest that the plan in question would be at least equally intelligible to the colour-blind man and the architect or engineer in full possession of his colour sense. As Professor Abercrombie admitted at the meeting that it would have been better to give this information on a larger number of plans (so as to avoid confusion), it is hardly playing the game, after holding up his hands at the meeting, now to attempt sniping in your columns.

I presume I ought to feel flattered at Professor Abercrombie wishing to know my name, and, personally, I have no objection to his doing so; but, as a matter of journalistic etiquette, he must know that it is an unusual thing to ask, and that I am compelled still to sign myself.—Yours, &c.,

THE WRITER OF THE TOWN-PLANNING ARTICLE.

March 5th, 1917.

VENTILATION SHAFTS ON PRIVATE HOUSE DRAINS.

To the Editor of THE SURVEYOR.

SIR,—Your correspondent's letter in THE SURVEYOR of 23rd February must have afforded Mr. Smith a good deal of amusement. The cheap criticism indulged in by Mr. Negus at the commencement compels one to think that his subsequent remarks were not meant to be taken seriously, and if this be the case, the criticisms offered are not calculated to be very helpful.

Having been connected with the practical work of the drainage of these houses, I have more than a passing interest in the letter, and suggestions made by your correspondent. The "pretty illustrations" were, I presume, given with the object of conveying a complete idea of the arrangement without unduly lengthening the accompanying letterpress, and in this were eminently successful.

I have very carefully compared the suggestions made, and might mention that it is within my knowledge that before the final arrangement was adopted most of these suggestions were fully considered. There are several "abominations" which I feel sure would not be tolerated by any sanitary expert. I will mention two.

(1) The suggestion to utilise a rain-water conductor as a vent-shaft is too ridiculous for words, especially so in the case of the houses in question, where the rhone crosses the dormer windows of the upper storey. I know of hundreds of cases where the by-laws read that all vent-shafts must be carried at least 3 ft. above the eaves, or 3 ft. above the highest opening in any wall.

(2) An open channel 5 ft. in length to take the sink and bath water would soon become a nuisance, a receptacle for grease, and an attraction for flies. "Convey the stuff away from the house as soon as you can" is even a sounder axiom than the one given by Mr. Negus.

It was unfortunate that space did not permit you, Mr. Editor, to publish the back elevation which I understand was sent with Mr. Smith's original article, for it would have demonstrated to Mr. Negus the impracticability of some of his suggestions.

The objection to joint drains in this case does not apply, for all the houses now being erected (and they will be counted in thousands) are the property of one owner—the Scottish National Housing Company—which fact was mentioned by Mr. Smith.

The reason for the adoption of the system under discussion was one of expense combined with efficiency, and I venture to say that at least one suggestion of Mr. Negus would be a great deal more costly. The length of piping from the house to the fresh-air inlet is so short that there is hardly any chance of foul air accumulating. Over 100 houses have been occupied since May, 1916, and after the experience of these months I can assure Mr. Negus that his fears as to foul emanations being carried are quite groundless.—Yours, &c.,

ROSYTH.

March 3rd, 1917.

The Summer Time Act.

ECONOMIES IN ARTIFICIAL LIGHT AND FUEL.

The report of the committee appointed by the late Home Secretary to inquire into the results of the Summer Time Act, 1916, and to consider whether it is advisable to reintroduce the system, was issued on Monday.

Its first conclusion of the committee is that, on consideration of the evidence as a whole, they "can unhesitatingly say that the vast preponderance of opinion throughout Great Britain is enthusiastically in favour of Summer Time, and of its renewal not only as a war measure, but as a permanent institution." They accordingly recommend that Summer Time should be reintroduced in 1917 and in subsequent years. They also propose:—

(1) That the period of the operation of Summer Time should be from the second Sunday in April to the third Sunday in September.

(2) That the change should be made on the night of Saturday and Sunday, and the reversion to normal time on the night of Sunday and Monday.

(3) That the variation should be one hour throughout the whole period.

In their review of the evidence, the committee several times point out the difficulty of arriving at definite conclusions with regard to the effect of the Act, having regard to the abnormal conditions arising out of the war, but under each head of their inquiry they indicate a consensus of favourable opinion.

With regard to the effect upon public health, they say that the general medical opinion communicated to them is that the extra hour in the open-air must have proved beneficial to the health of those who enjoyed it; although, at the moment, no particular facts and figures could be adduced in support of the statement. The police authorities have been the main source of information in regard to the effects of the Act on public morals and order, and there was a consensus of opinion among them that the operation of the Act resulted in a definite improvement. "The tendency throughout the country to spend the extra hour of daylight in the evenings out of doors is said of itself to have made for an improvement in the general moral tone." The committee have "evidence from all sources of the value of the extra daylight to the very large number of workers who cultivate gardens and allotments."

Extensive inquiries were made among gas and electric light undertakings as to the economies in artificial light and fuel effected during the Summer Time period, but great difficulty was experienced in obtaining definite information. Overtime and night work in industrial districts, and, on the other hand, the lighting restrictions, made the conditions quite exceptional; but the committee say it is nevertheless perfectly clear that the substitution of an hour's daylight in the evening for an hour's artificial light must have resulted in a considerable net saving.

ELECTRIC LIGHT.

Replies were received from over eighty municipal electric light undertakings, from between fifty and sixty private companies, and from eleven electric power companies. The estimates of the reduction in the consumption of electric light vary very widely, from 1·25 per cent in one case to 55 per cent in another.

The returns from the power companies give a mean reduction of 20 per cent for lighting purposes, thirty-eight private companies furnished figures which give an estimate of reduction varying from 10 to 41 per cent, the mean of the thirty-eight being 23 per cent, and sixty-four municipal undertakings give a mean reduction of 15·5 per cent in units used for lighting.

It would appear, the committee observe, "that the estimates of the saving in coal and the reduction in expenditure on artificial light are largely calculated on the basis of the estimate of the reduction in the consumption of units, and are therefore subject to exactly the same criticisms as that figure. Further, so far as the saving in coal is concerned, it is pointed out in many cases that the falling off in the quality of the coal supplied last year as compared with previous years increased the difficulty of arriving at an accurate figure. Our returns, however, show clearly that the saving in coal throughout the country must have been considerable. One point should be made clear in this connection—viz., that, although in some few cases there may be a reduction in the consumption of coal more or less proportionate to the reduction in the consumption of artificial light in other cases (*e.g.*, in the case of companies which supply a considerable amount of electricity for power purposes), the saving in coal may be trifling. As the plant has to be kept in readiness to supply the maximum demand and the consumption of coal for 'standby' is an important factor in the total consumption, particularly in summer time, when although boiler and electric pressure have to be maintained throughout the twenty-four hours, the actual lighting hours are very few."

An interesting calculation as to the three main sections of our inquiries was placed before the committee by Mr. Faraday Proctor, the hon. secretary of the Incorporated Municipal Electrical Association. In his calculation Mr. Proctor assumed as his basis that the Summer Time period would extend from the beginning of April to the end of September. The following are his words:—

"The lighting consumption in the six winter months may be taken on the average as being twice that of the six summer months. If, therefore, the diminution in consumption is taken at from 5 per cent to 25 per cent for the summer months, this corresponds to a diminution of from 1·7 to 8·3 per cent of the lighting consumption for the whole year. I have extracted data from the copies of the annual accounts of all those municipalities who show the output from lighting as distinct from the output for power and other purposes, and the same indicates that the total number of units sold is 4·37 times the number sold for lighting only, that is to say, the lighting units are 22·883 per cent of the total units output. The figures I have extracted relate to undertakings representing about 25 per cent of the total output by municipalities or about 17½ per cent of the total output by municipalities plus companies as returned in Garcke's Manual, and may, I think, therefore be taken as representing a reasonable average, and if these figures are accepted, then the diminution in the consumption due to the Summer Time Act would represent from ·39 per cent to 1·9 per cent of the total units sold per annum for all purposes throughout the kingdom.

"The total units sold for all purposes by municipalities and companies is about 2,000 millions per annum. At 3½ lb. of coal per unit sold this would represent a consumption of 3,125,000 tons of coal per annum. At 4½ lb. of coal per unit sold this would represent a consumption of 4,017,000 tons of coal per annum. [Mr. Proctor considered this to be the most reasonable figure to take as an average. The figure varied—in Bristol it was 4½ lb., in Manchester 3½ lb., but in other places it would be considerably higher.] At 5½ lb. of coal per unit sold this would represent a consumption of 4,910,000 tons of coal per annum.

"Owing to the standing charges, a diminution of the units sold does not result in a corresponding diminution in the coal bill. I estimate in my own undertaking, which may perhaps be taken as an average, that the diminution in the output would result in a saving of only 66 per cent of a corresponding diminution in the coal bill. Therefore, if the total units sold are reduced by from ·39 per cent to 1·9 per cent, the coal bill would be reduced by, say, 66 per cent of this—viz., by from ·2574 per cent to 1·254 per cent—and on the table of coal consumptions above given the resultant saving in coal throughout the kingdom, in respect of the supplies afforded by municipalities and companies, would be as shown in the table on p. 259.

"With such widely divergent views as to the percentage reduction in the consumption of electricity for lighting, it is difficult, and perhaps presumptuous, for me to suggest what percentage figure should be accepted, but I should say that one should not look to the saving in coal exceeding from 10,000 to 20,000 tons per annum as directly attributable to the variation of one hour per day Summer Time for a period of six summer months. If the lighting units are as

mentioned above, 22·883 per cent of the total units, the total lighting units per annum would approximate 457,660,000. A reduction of 1·7 per cent in the lighting units will amount to 7,780,000 units per annum. A reduction of 8·3 per cent in the lighting units will amount to 37,980,000 units per annum.

"The average revenue from lighting is about 2·7d. per unit, and therefore the loss in gross revenue to electrical undertakers and the saving in expenditure by consumers would approximate in the case of the lower estimate to £87,520, and in the case of the higher estimate to £427,290."

INCREASED CHARGES.

The committee also addressed to electric light concerns a question as to whether the charge for light had been increased during the Summer Time period, and they found that such had been the case with a very considerable proportion of the undertakings. This was so with about 30 per cent of the municipalities, and nearly 50 per cent of the private companies who replied to the circulars. In many cases, however, it was pointed out that the increase had been decided upon before the Summer Time Act came into operation, and was due to other causes, such as the increase in the price of coal and the cost of labour and stores; while in the other cases, almost without exception it is stated that the increase last year was only partly due to the Act. It is frequently pointed out that an increase in charges will probably be necessary in future years if Summer Time is renewed, more particularly in the case of the smaller concerns where lighting forms the most important part of the business.

GAS.

Replies were received from eighty-five gas undertakings, the majority of whom gave figures, though many emphasised the difficulty of arriving at even approximate estimates of the kind required. In addition to the influence of the lighting restrictions and of the other factors already mentioned, there was, in the case of the gas undertakings, the further complication of a very large increase since the summer of 1915 in the quantity of gas supplied (1) to private houses, for heating and cooking purposes in the place of coal, and (2) in industrial districts, to munition and other factories for power, resulting, in the case of a considerable number of undertakings, in a substantial increase in the total output of gas over the Summer Time period as compared with 1915. It appears that the nature of the records kept by the majority of the undertakings did not permit of their being readily sifted for the purpose of arriving at the estimate asked for, particularly with the limited time and staff at the disposal of the management. Accordingly, as in the case of the estimates from the electricity concerns, there was a considerable diversity in the methods of calculation employed. In many instances it was not indicated what had been the basis of reckoning.

The estimates of the percentage of reduction in consumption of gas for lighting purposes varied from 2 per cent to 26 per cent. The mean—not, the committee points out, a very valuable figure in the circumstances—works out at about 9 per cent.

Mr. Hanbury Thomas, of the Sheffield United Gas Company, has suggested that a general estimate for the whole country can be arrived at from the figures of actual saving in coal given in the replies from those undertakings who use coal and no other fuel, on the following plan: The amount of coal stated by such undertakings (twenty-eight in number) to have been saved as a direct result of Summer Time works out in the aggregate at 1·449 per cent of the total annual quantity carbonised by them. The total quantity of coal used by all gas undertakings in the United Kingdom in 1915 was, in round figures, 18,000,000 tons. Reckoning 1·449 per cent of these figures, therefore, the saving in coal effected by gas undertakings in the United Kingdom as a result of the four and a-half months of Summer Time may be put at about 260,000 tons. Further, applying the same percentage to the total annual sum spent by consumers on gas (reckoned on the total annual sales of gas undertakings,* at 3s. per 1,000 cub. ft.) the saving in expenditure to consumers works out at about £475,000.

"These estimates cannot, of course," the committee observe, "be regarded as anything but conjectural; but they represent the best that can be done with the figures, and are not perhaps very far wide of the mark."

The report adds that there must also have been a very considerable saving in the quantity of oil used by those gas undertakings which manufacture water-gas, but, unfortunately, the committee have not sufficient data to make it possible to form an estimate.

ILLUMINATING OILS.

Mr. E. Houghton Fry, the secretary of the Committee for the Regulation of Petroleum Supplies, supplied the committee with a report as to the effects of Summer Time on the consumption of illuminating oils in this country. Mr. Fry estimates that the economy effected by the Summer Time Act in the consumption of these oils amounts to about 2¼ per cent of the consumption for the year—*i.e.*, approximately 11,500 tons. Mr. Fry adds—"This seems a very modest proportion, but it should be remembered that 11,500 tons represents two journeys by an oil-tanker, which would occupy approximately four months, and this saving therefore can by no means be regarded as negligible. In fact, owing to the shortage that is at present being experienced in these vessels, the result is a very welcome one."

IRISH OPINION DIVIDED.

The committee found that Irish opinion is divided on the question of Summer Time. It was clear from the evidence that the benefits of the Act were thoroughly appreciated and enjoyed by the very large majority of town dwellers in Ireland, and in particular by those engaged in trade, business, or industry, both employers and workers. On the other hand, it was also clear that, while farmers are by no means unanimous on the question, the bulk of agricultural opinion is unfavourable to Summer Time.

TOTAL ANNUAL COAL CONSUMPTION, AND SAVING IN SAME DUE TO SUMMER TIME ACT ON LOW, MEAN, AND HIGH ESTIMATES.

Estimate.		Low.	High.	
	Reduction in lighting units:—	5	25	(Summer period only.)
	Total coal for light and power ...	Saving ·2574	Saving 1·254	Per annum.
Low	3,125,000 tons	8,043 tons	39,187 tons	,,
Mean	4,017,060 ,, ...	10,340 ,,	50,370 ,,	,,
High	4,910,000 ,, ...	12,640 ,,	61,570 ,,	,,

Waterproof Walls.—There are two methods of constructing houses with dry external walls. One is to form a cavity in the wall, and the other is to build a solid wall and then render it with waterproofed cement. It has been proved in practice (writes a correspondent) that the latter, in addition to being the surer way, is also the more economical. In a recent town-planning scheme at Bradford, Yorks, the houses were built with solid walls and rough-casted with Pudlocd cement, and the result has proved satisfactory.

The Metric System.—On the 1st inst., in the House of Commons, Mr. Bonar Law stated, in reply to a question, that, in view of the fact that the Committee on Commercial and Industrial Policy after the War is already considering the proposals which have been made for the adoption of the metric system in this country, he does not think that any useful purpose would be served by the appointment at the present time of a Select Committee to consider how the system can best be applied within the Empire.

* According to the Board of Trade returns for 1913, plus 6 per cent, which Mr. Hanbury Thomas thinks might be added to represent the increased consumption since that year.

Cultivation of Lands Order, 1916.

By REGINALD BROWN, Surveyor to the Southall-Norwood Urban District Council.

Many surveyors to local authorities have had a good deal of work placed upon their shoulders since the steps to carrying out the provisions of the above Order. The writer has taken a leading part in the work in the district of Southall-Norwood, and by reason of this he can appreciate the huge amount of labour which has been, and still remains, necessary to secure good results. When the Order came it, have the council of his district passed a resolution to leave the whole matter of securing land and the purchase and sale of the necessary seed, &c., in the writer's hands. The real reason is best known to the council he has the honour of serving, but probably it was because of the writer's intimate connection with the cultivation of land as president of several societies. The writer appreciates the confidence of his council, and these articles have been written to show what can be done with the exercise of energy and perseverance on the part of public officials. The writer, however, does not claim to have done more than many of his colleagues in other towns, probably he has fallen short in his endeavours, but he has done his best to carry out the spirit of the Order—to get as much land under cultivation as possible.

Agriculture is once again coming into its own. It behoves the people of these isles to be more reliant on themselves in the future than they have been in the past, and it is hoped that the steps now being taken through the Board of Agriculture will be lasting, and will prove to the people the importance of seeing that every square yard of land shall bear its full quota of food instead of permitting it to be half utilised. Thousands upon thousands of acres of good land, even now, are yearning for the plough, spade or fork, but from want of organisation and some sort of driving power from a central authority cultivation of land up and down the country has never been carried out to its fullest capacity.

The Example of other Countries.

In almost every country besides "free" England the Central Department would have some sort of voice in what should and should not be produced on the land. We in England dread the word "compulsion," for there is always a section of the community which, although loudly decrying compulsion, by their very actions causes "compulsion" to be brought in. It is pleasant to think that the majority of landowners do carry out their responsibilities in a proper manner, but a minority compels the bringing into force of measures which hurt the feelings of good landowners, and all have to suffer because of the wilfulness of the few. Why, even the Cultivation of Lands Order was necessary to compel the bringing into cultivation of large tracts of land within and in the vicinity of urban areas, which may be lying idle for years, and producing neither agricultural food, only bad odours, miasma, and rubbish. Up to the present eight of have been necessary.

It must not, however, be forgotten that it is not all the fault of the owners, some of it is due to the want of appreciation by the higher authorities of the necessities of food production, and possibly to the difficulties created by statute in the vacation of land [illegible] and other reasons which need not be detailed here.

The interest in land cultivation at the present time is due to the realisation of the necessity of producing more food crops, and this has come about through the energetic action of the Board of Agriculture. This Board sees the necessity of growing potatoes, and to my mind, potatoes are grown. It seems very feebly that the people want a lead [illegible] what to grow, give them facilities to [illegible] grant them protection in a form which varies according to circumstances, and we shall have no more a food shortage at least from the point of food which can be grown within the confines of these islands. We are not yet wholly "a people of the town."

Food Requirements' Details.

Agriculture is once coming into its own. How has it fared in the past? Look at the many things which might have been produced out of the land if only sufficient encouragement had been provided; if only a lead had been given; if there had been some sort of direction from the central authority—a direction which might have been conveyed in a friendly suggestion with the power to enforce if needs be this power only to be used where there was a flagrant disregard of the necessity of the people; and who *should* know better as to what the country needs than those Departments which exist, or should exist, for the very purpose of keeping their fingers on the throbbing pulse of the requirements of the people in the matter of food.

Take one illustration only: If the country needs the production of beet for sugar, ought it to be left to the whim and fancy of individuals to plant or not just as they think fit? Think you such would be permitted in any highly-organised country. Not a bit of it. If beet was necessary to be grown for the people then the Government would see that beet was produced. And by what means? First of all, education as to how beet should be grown; agricultural professors would have stumped the country, carrying with them Government authority; full notice would have preceded their visits to all districts, and cultivators of land would have had public intimation that they were *expected* to attend the lectures to be given by the professors, so as to learn how to grow beet to the best advantage, and not only how to grow beet, but also the after-treatment thereof. The farmers would be told what the Government expected of each of them, and what proportion of beet they should grow according to their holding.

I, for one, cannot but believe that this would be quite sufficient for "good" Britishers, but to urge on the "slackers" it would be necessary one is bound to confess, probably with regret, that some statutory powers would be needed—the Government would say in effect to a holder of land: "Are you growing beet in accordance with the suggestions made? If not, why not?" And very good cause would have to be shown for farmers to escape the effect of their neglect. But such powers—in England—would, it is certain, be seldom exercised, because farmers would rise to the occasion. Sugar beet is only given as an illustration. The point is, say what is wanted and we shall get it; and, no doubt, without compulsion.

(To be continued.)

MR. PROTHERO'S CIRCULAR TO LOCAL AUTHORITIES.

In reference to the extended powers granted to local authorities under the Cultivation of Lands Order to enter on any land, whether occupied or unoccupied, without the owner's or occupier's consent, Mr. Prothero notifies local authorities that these should be exercised with the greatest possible care and discretion, and should not be used to interfere with land which is already being fully cultivated, or with meadow or pasture land of good quality, the breaking up of which would involve considerable expenditure on restoration on the termination of the occupation.

In view of the urgent importance of maintaining the milk supply, no land should be taken which is being used for the grazing of cows, or which is otherwise essential for dairy purposes.

The local authority will still require the further consent of the Board for entry on common land, and it may not enter on any garden or pleasure ground occupied, or usually occupied, with a dwelling-house.

Mr. Prothero does not think that public recreation grounds, in populated areas, which are turfed and are used to any substantial extent for recreation, can with advantage be broken up, but there is much public land which does not fall within this category.

A report on the cultivation of parks and open spaces was presented by the Parks and Small Holdings Committee at Tuesday's meeting of the London County Council. The committee recommended that in districts in which the Council is unable otherwise to secure land under the Cultivation of Lands Order, 1917 (No. 2), to satisfy applicants for allot-

The Surveyor
And Municipal and County Engineer.

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ments, the cultivation of portions of parks or open spaces under the control of the council should be authorised.—The recommendation was adopted.

The Lady and the War-time Dustmen.—While we are in the midst of a gigantic war (says a writer in the *Bristol Times and Mirror*) people cannot expect the conditions of life, nor even the arrangements made for our comfort by the Bristol City Fathers, to continue to run like clockwork. A point which arose at the local tribunal, when the Bristol Sanitary Authority presented certain claims, leads us to make this remark. The city engineer (Mr. L. S. McKenzie) has acted admirably in giving up men for the King's service, as the proceedings before the tribunal showed. Half the ashmen are now "strappers," and the circumstance that they have not been trained in deportment and Johnsonian English has apparently vexed a certain lady. At any rate, she wrote to the city engineer complaining of the men, and stating that they cannot speak the King's English! The city engineer has replied to the letter explaining, with all politeness, that he does not guarantee that all the ashmen he engages shall have had a college education. We suggest that when National Service is fully developed he may possibly be able to find an old University man willing to remove ashes rather than be accounted a shirker. That suggestion, too, for the consolation of the lady.

New Baths at Glasgow.—The opening took place last week of new swimming baths and a wash-house which have been provided for the district of Govan-hill by the Glasgow Corporation. The site of the buildings covers an area of 3,455 sq. yds. The frontages to two streets are built of stone, and the other walls are of brick; the walls inside are tiled; the floors of bath and pond rooms are of terrazzo, and the floors of the hot rooms are of tiles. There are two swimming ponds and a "learners'" pond, with hot and cold sprays, foot baths, &c., in each pond room; a Turkish bath with three hot rooms, a Russian bath, a shampooing room with two marble slabs, a cold plunge bath, and a cooling room with twenty beds. The water in the ponds is heated by the exhaust steam from a pump which is used for drawing the water continuously from the ponds, and is worked in connection with the filtration and aëration plant. There is an arrangement for mixing salt connected with this plant so that salt-water baths can be had. Ferro-concrete has been extensively used in the construction of the buildings. The public wash-house is fitted with sixty-eight wash stalls, and space has been reserved for a further fourteen. The cost of the establishment was about £35,000, exclusive of the price of the ground.

SCOTTISH NOTES.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Scottish Notes," 24 Bride-lane, Fleet-street, E.C.]

Scottish Housing Council. At the meeting of the National Housing and Town Planning Council, held in Glasgow in November last, a Scottish Committee was appointed to work in co-operation with the National Council, and to represent local authorities and other interests involved, in view of the importance of public opinion being educated on the subject of housing and town planning, in order that the interests of Scotland should be adequately safeguarded. This committee has now got to work, and at its first meeting, held in Edinburgh on February 13th, under the chairmanship of Sir Thos. Hunter, the town clerk of Edinburgh, very good progress was made.

* * * *

Town-planning conferences have, in the opinion of many, degenerated—there has been plenty of talk, but no practical results. The Scottish Committee do not wish to have any such charge laid to their door. Three sub-committees have been appointed, and to these have been remitted the duty (1) of framing a policy of general action; (2) of guiding the committee in all matters technical; and (3) of arranging for impressing on Parliament, by deputation or otherwise, the need for immediate action to make good the demand for housing accommodation.

* * * *

The Need for Housing. The demand for additional housing accommodation is real and urgent, and local authorities or other agencies must be prepared to face the erection of fully 40,000 dwellings immediately the war is over. That Parliament must contribute towards the cost of such an enormous building project is undeniable, but it is to be hoped that the contribution will be on strict business lines.

* * * *

In this connection the pending report of the Royal Commission on Housing in Scotland will be of very great interest. Not only will it verify facts as to shortage of housing accommodation, but it is expected to give a lead as to the financial arrangements.

* * * *

"No Interest" Loans. Of late there has been a considerable cry for "no interest" loans for housing purposes. The writer considers the success of any such movement as fatal to all true progress. Housing schemes should be such that the rents charged should meet all the charges which have to be met in providing the houses. The better for the nation it will be when each industry recognises the necessity for its being self-supporting in the sense that the workmen engaged in it should be paid such wages as will enable them to provide the necessities of life, including proper housing accommodation.

* * * *

The problem of the very poor is one of difficulty, and any policy of housing for such must of necessity be State-aided. It will tax the wisdom of the best of our housing reformers to find a solution satisfactory to all the interests involved.

* * * *

The Problem of Housing Generally. The whole question of housing presents a difficult problem—its aspects are so varied. There is the housing problem of the city, the housing problem of the mining area, the special industrial area, and the rural area. The first appeals practically to every local authority, and presents the fewest difficulties, but when we come to the mining and special industrial areas, the question at once arises, Who is responsible? Is the mine-owner, the steel smelter, or the manufacturer, whose enterprise has brought the workers together and hence caused the need for houses to be required to provide the necessary accommodation? And what is to be the standard demanded? Or is the local authority to be

required to provide the housing? If the last named, what is to be the attitude of the general ratepayer to such a policy? Again, as regards rural conditions, many landowners have done their duty faithfully, and beautiful, healthful villages are to be found on many estates. But what of the owner who has not fulfilled his duty? Is the local authority or the State to relieve him of his obligations? The writer merely suggests the difficulties, and trusts that others interested may continue the discussion.

* * * *

Vote of Confidence in an Official.

The writer wishes to take this opportunity of congratulating Mr. Wm. Watson, the burgh surveyor of St. Andrews, on the vote of confidence he received from his town council recently. For some considerable time certain members of the town council have overstepped all limits in their criticism of Mr. Watson's work, and on Mr. Watson being asked some time ago to undertake work of national importance for a Government department, which involved his presence in Edinburgh for four days per week, they seemed to find their chance to move that his services be dispensed with. Fortunately, however, the other members of the council had other ideas of Mr. Watson's worth, and the heartiness of their expressions of appreciation should go a long way to silence the critics and to strengthen the hands of Mr. Watson.

* * * *

No official is against just and honest criticism of his work. The best is not free from mistakes, and intelligent and sympathetic criticism should never be resented, but when one finds councillors using their public positions as an avenue for their personal spleen, the matter calls for protest. Mr. Watson's friends trust that he has heard the last of this unpleasant matter.

OFFICIALS ON ACTIVE SERVICE.

A QUESTION OF PRINCIPLE.

At last Friday's meeting of the Metropolitan Water Board an interesting report dealing with the position of officials serving with the forces was presented by the General Purposes Committee in proposing a number of increases of salary.

The committee stated that they had had no difficulty in adopting the view that where an officer on active service was in a class carrying automatic scale increments, he should continue to receive those increments, subject to the usual certificate of good behaviour. Where, however, an officer on active service was at the head of a class, and the point, therefore, was one of promotion to the next class, a question of principle arose which called for careful consideration.

"On August 4, 1914," the committee pointed out, "the board passed a resolution giving leave of absence to officers and servants during naval or military service, and undertook to reinstate them on their return with no loss of 'position' or 'emoluments' consequent on enforced absence. This resolution related in the first instance to men who were mobilised or embodied on the outbreak of war, but was extended to those who voluntarily joined the Forces.

"It will be seen that the reinstatement without loss of position or emoluments is to occur on the man's return to civil duty. On this it has been argued that the board would fulfil their promise if all promotion or increase of pay were withheld until such return, the man then being placed in the position he would have occupied had he not gone to the Army.

"At first sight this contention seems reasonable; but a close examination reveals circumstances which call for consideration. As an illustration we take the case of two men who at the outbreak of war were in identical positions in the board's service. One of them joins the Army, the other is medically rejected. The latter gained retains in civil employment and obtains such promotions and increased increments as would be given in the ordinary course of business. His remuneration of salary come to him year by year, and he has the opportunity of investing them or otherwise putting them to good use as and when received. Then taking a period of, say, three years with £20 increments, he would have enjoyed by way of increased emoluments:—

First increment for three years ...	...	£60
Second increment for two years	...	40
Third increment for one year ...	...	20
		£120

"As against this, the man on military service, though receiving £120 on his return to civil duty, would have been deprived of the use and enjoyment of that sum during the period of his military service, when it would have been valuable for investment or the support of dependants.

"Then again, take the way in which the question of superannuation would be affected if promotion be deferred pending the return to civil duty. Under the Board's printed scheme the superannuation is to be based upon the average salary during the period of five years immediately preceding the termination of civil service. The case of the sailor or soldier returning after three years' service may again be used as an illustration. If he comes home having lost his eyesight or the use of his hands or being otherwise incapacitated by war for the board's service, he is entitled to his superannuation. But in assessing this he would be unable to bring into account the three years' increments illustrated above, with the result that his average salary for the five years would be reduced and his pension diminished. This is a matter of importance, especially when it is borne in mind that superannuation is partly paid out of moneys deducted from salary—is, in fact, deferred pay. It is difficult to see why a soldier officer of the board placing his life in hourly jeopardy should be at a disadvantage as regards deferred pay when compared with a man medically rejected who is enabled to remain at home and avoid the dangers and privations of the fighting line.

EFFECT OF PROMOTION.

"A further question was raised as to whether the Local Government (Emergency Provisions) Act, 1916, debars the board from promoting an officer who is on active service. On referring to the Act it is seen that the board are empowered to grant leave of absence for service with H.M. Forces, and that they may, whilst an officer is so serving, pay a sum which shall not exceed the civil remuneration after deducting the amount of the naval or military pay and allowances. The question is as to whether the civil remuneration mentioned in the Act is to be that which prevailed at the time the officer joined the Forces, or such civil remuneration as he may from time to time be receiving under any promotion awarded him by the board. The solicitor is of opinion that the civil remuneration referred to must be that which was being paid to an officer at the time when leave of absence was given.

"This legal difficulty involves a further reference to the provisions of the Local Government (Emergency Provisions) Act, 1916. The statute empowers the Local Government Board to sanction the payment of a sum which exceeds the civil remuneration after deducting the naval or military pay and allowances. It also prescribes that such sanction shall be given where it appears to the Local Government Board that the man joined H.M. Forces in reliance upon some resolution or promise, and that the amount of the excess is not unreasonable. In a circular letter issued to local authorities on May 26, 1916, the Local Government Board indicated that they would not regard as unreasonable for the purpose of this provision the payment by way of total civil and naval or military pay and allowances of a sum not exceeding by more than 25 per cent the amount of the civil remuneration that the man would be receiving if he had not joined the Colours. It would appear, therefore, that if the board promote a sailor or soldier to a superior class which he might have attained had he not gone to the Colours, it is then open to the Local Government Board to sanction the payment to him of the increased difference between his civil and military pay and allowances."

Officers, permanent and temporary, now actually engaged in the Metropolitan Water Board's business, are receiving £16,977 less than the pre-war staff. The saving is, however, more than absorbed by the difference between Crown pay and civil pay paid to officers serving with the Colours.

Highways and Byways.*

By LAWRENCE W. CHUBB, Secretary to the Commons and Footpaths Preservation Society.

(Conclusion.)

The public should be on their guard against the unauthorised diversion of rights of way. It sometimes happens that diversions are effected without a magistrate's certificate. The new path is quite as convenient as the old, and no objection is raised to the change. But disputes have been decided against the public largely on this point, for it is argued that, since everyone is expected to know that certain elaborate formalities must be complied with before the line of a public path may be lawfully changed, acquiescence in an irregular diversion may be taken to indicate that the path was not a reputed public way.

Far more dangerous, however, is the temporary or permanent obstruction of rights of way. Gates are occasionally locked, stiles bushed up, or hurdles placed across the route. The occasional obstruction of footpaths is sometimes tolerated from a mistaken neighbourly feeling. In a protracted action about a path near Purley, one of the main factors which led to the loss of the way was evidence that it had been the habit of the occupier of the land during the lambing season to place hurdles to form a sheep-fold in a corner of a field through which the way passed. People merely walked around the fold, but much was made by judge and counsel of the fact that they had tolerated this temporary obstruction without demur.

REMOVAL OF OBSTRUCTIONS.

Definite forms of obstruction are more easy to meet, because they are more apparent. Sometimes formidable barriers are erected, and I recently inspected a path which had been obstructed by the cutting of a dyke 12 ft. wide and 7 ft. deep. In a case in which the Commons Society was concerned, and which occurred at Snettisham (*Norfolk County Council* v. *Green* (1904), 90 L.T., 451), wagon loads of railway sleepers were conveyed to the spot and deeply embedded across the path. Moreover, barbed wire entanglements were introduced which might have served as a model for the Hun. They were all removed by the sturdy village fishermen, whose action was upheld by the High Courts.

It is not always safe for members of the public to take the law into their own hands by removing obstructions. In any event, it is imperative that they should be certain that the obstructed path is a public way, and that they should do no more damage than is actually necessary to secure reasonable passage. Courts of Law view with suspicion the acts of a private individual who seeks to remedy a public nuisance by physical force. For instance, a few years ago a member of the Commons Society removed a locked gate which had been erected across a carriage-road. Proceedings were taken against him, and he proved that the road was a public way. Nevertheless, he was ordered to pay the costs, because he had removed not only the gate, but also the iron staples in the gate-posts into which the hinges of the gate had been fixed. It was held that he had done more damage than was necessary.

DIFFICULTY OF PROVING PUBLIC RIGHT.

It will thus be seen that the owner seeking to deprive the public of a right of way has available a variety of methods of attack; and he can slowly build up a case, even when an ancient path is involved, to show, by a series of repressive acts, that he did not intend to dedicate a way and to raise the presumption that his predecessors did not do so either. He has also the enormous advantage of knowing that, whether he is plaintiff or defendant, the burden of proof lies on the side which is championing the public cause. It is necessary for the public to show upon what they base their claim of dedication before the owner is called upon for a reply. To the layman, therefore, the fight is bound sometimes to seem unfair, especially since the tenants and employees of an estate, for obvious reasons, cannot be called as witnesses to support a claim of right against the estate, and that, even if they were willing to testify, their special knowledge would be of little service because their user of the path would be deemed to have been privileged.

And the owner has also other great advantages. We have seen that all public rights of way which were not created under statutory authority must, in legal theory, have originated in dedication, and that the process of dedication is tantamount to the free gift or grant to the public of an irrevocable licence to use such ways. The only person who can make this gift or grant is the absolute owner of the freehold. A person who enjoys a limited interest in the property is not the actual freeholder, and, consequently, it is held that he cannot burden the estate in which he is interested by the grant of a perpetual licence or easement in favour of the public.

A great proportion of the land in this country is in the hands of tenants for life; it is strictly entailed or subject to family settlements, and it may have been in that condition for hundreds of years. The tenant for life is not the actual freeholder, and therefore he cannot, in a technical sense, burden the land in which he is interested with perpetual rights of way in favour of the public, save in the manner permitted under the Settled Land Acts. If a break, however brief, in the family settlements can be established, the difficulty disappears, but judges differ in their method of dealing with disputes about rights of way on land which has been strictly entailed throughout living memory. Some insist upon proof that the public enjoyed the use of the alleged way before the family settlements commenced. For instance, the late Lord Alverstone, when Lord Chief Justice of England, tried a case with reference to a disputed roadway on the Trentham estate of the Duke of Sutherland. Evidence was produced of actual public user for eighty-five years; there was little rebutting evidence and the issue seemed clear. The jury returned a verdict to the effect that a public right of way had been obtained by long user, but that the present Duke had not intended to dedicate—a fairly safe rider seeing that the road was obstructed whilst he was owner. This verdict was set aside by Lord Alverstone on the grounds that the land had been strictly and continuously entailed since 1760; that he had no evidence of the public use of the way before 1760; and that since that time no dedication could be presumed to have arisen by mere user.

If it were followed by all judges this strict view of the law would render impossible the proof of public paths on estates which were entailed before living memory. Fortunately, however, other judges got over the technical difficulty by holding, in cases in which there is ample evidence of public user throughout living memory, and in which the user cannot be shown to have commenced during the period of settlement, that dedication must have taken place before the period of entail began. Lord Justice Chitty, in the course of proceedings with regard to a Sussex path, adopted this attitude, and brushed aside a claim that no public right of way could be proved because the estate had been entailed since the time of William and Mary, by saying that, if necessary, he would presume that dedication took place in the reign of William the Conqueror.

This uncertainty in the administration of the law is a serious hardship to litigants. The owner does not know what attitude a particular judge may adopt with regard to what may be his strongest line of defence. On the other hand, local authorities fear to embark upon litigation, even in cases where the evidence is overwhelmingly in favour of the public, because the existence of an unknown family settlement may be sprung upon them at the last moment.

Accordingly, a widespread feeling has arisen on both sides that the proof of public rights of way should be placed upon a more equitable and sure basis. In the case of private ways no ambiguity exists, for under the Prescription Act proof of the unchallenged enjoyment for forty years is sufficient to establish a claim to a private easement even against a settled estate.

AMENDMENT OF THE LAW.

The Commons and Footpaths Preservation Society

* Paper read before the Royal Society of Arts on the 14th ult.

have, therefore, ever since 1907 been pressing for an alteration of the law, and on their behalf a Public Rights of Way Bill has made several appearances in Parliament. This Bill proposes that where an estate is in the hands of an actual freeholder, open and uninterrupted public user of a path for twenty years shall be sufficient to raise the presumption of dedication. If, however, the estate is entailed, or subject to any other technical disability, it is proposed that the period of user shall be forty years. This Bill has met with little opposition, for the justice of its principles is recognised and the need for its passage is generally admitted. In different sessions it has passed the House of Commons and House of Lords by overwhelming majorities, but the time available for the discussion of private members' Bills is so brief that the Bill has not yet been approved by both Houses in the same session. It may be hoped that when normal times again come the Government of the day may be prevailed upon to give facilities for the passage of this useful measure.

THE CUL-DE-SAC.

Another serious difficulty in maintaining rights of way has arisen from the divergent views of judges on the question whether a public footpath may lead to a place of historic interest or natural beauty, or whether it must lead to another public way. Many of our most cherished paths are valued because they give access to a mountain top or glen, to a cliff, or to a ruined castle. A beautiful view is a national asset. It may have been available to the community for centuries and beaten tracks worn by the feet of many thousands of tourists may approach it. Nevertheless, some judges hold that such paths are permissive, and that they may be closed to the innocent enjoyment of the public unless a through route can be maintained. It is surely illogical to contend that, whereas a public highway in a town may be a *cul de sac*, every public right of way in the country must be a thoroughfare.

In the case of a path leading to a mountain top in Cumberland, a public right of way was established with the help of the Commons Society, which also assisted in the legal fight which led to the reopening of a road to the Giant's Causeway in Ireland. Unfortunately, however, in the case of public access to Stonehenge, the society was defeated in its attempt to establish a public right of access.

The caging in of Stonehenge by means of a barbed wire fence and the charge of one shilling admission to the enclosure, aroused violent opposition, for this famous circle of stones is recognised as the most imposing and interesting of all the prehistoric remains in England. For hundreds, if not for thousands of years, this early cathedral of the British race had been approached by deeply scored roadways which cross the Wiltshire Downs for long distances. It was alleged that the stones were suffering damage, but the society pointed out that if that were the case it was open to the owner, while retaining all his proprietary interests in the monument, to constitute the Office of Works guardians of Stonehenge under the Ancient Monuments Act, and they would thereupon be bound to protect the remains.

It offered to raise £10,000 in order to purchase the owner's rights and to protect the stones without enclosure. This offer was declined, although, after first asking an enormous sum for his interests, the owner came down in price to £50,000. The society felt that it would be neither right nor possible to raise this exorbitant amount, and with great regret [illegible] and the committee eventually decided to institute legal proceedings against the owner, Sir Edmund Antrobus, who had obstructed the ancient [illegible].

The [illegible] lasted seven days, and finally the jury found against the society's claims in the first place because the existence of a long-standing enclosure was deemed to prevent the presumption of the dedication of through routes; and, in the second place because, in his view, a public way could not lead to a place of historic interest, such as Stonehenge.

Thus has been the only case in which the society has carried a dispute to the Law Courts during a fifty years fight for public rights of way, and the [illegible] aroused by its efforts to maintain an important public privilege has determined it not to rest content until this point, too, is finally settled by Parliament in accordance with the dictates of [illegible] and equity.

In the meantime the death of Sir Edmund Antrobus led last year to the sale of Stonehenge. The monument realised at public auction £6,600—or £3,400 less than the society offered to raise in 1901 in order that the remains might be permanently preserved for the nation. Stonehenge is still in private hands, and the estate is considerably poorer than would have been the case had the society's offer been accepted.

LITIGATION AND ARBITRATION.

Litigation with regard to rights of way is an expensive matter. The Stonehenge case cost the society almost £4,000; that amount, although large, is small in comparison with costs which followed a bitterly-contested action about Yorkshire footpaths, and which amounted to over £15,000. Heavy expense is unavoidable, because a host of witnesses must be produced on each side, and also because the cost of investigating ancient titles is often considerable. By simplifying the law, and laying down fixed rules for the guidance of judges and counsel, the Society's Public Rights of Way Bill will greatly reduce the burden of expense in connection with footpath litigation.

It must not be thought that the Commons and Footpaths Preservation Society is a litigious body. That is not the case, and very few of the thousands of disputes which have been brought to its notice have found their way to a court of law. It frequently happens that a representation to the landowner involved is sufficient to secure a recognition of the public rights. It is a pleasing duty, too, to bear record that most highway authorities are determined to perform their duty to the community in the matter. There are naturally exceptions to this rule, but the relations between the society and parish and district councils are, in general, of the most satisfactory and cordial character, and many councils make it a practice to refer to the society for advice in every case arising in their areas with regard to rights of way.

Nor should it be imagined that all landowners adopt the attitude of the autocrat who proudly said—

> "I am monarch of all I survey,
> My right there is none to dispute."

There are, it is true, too many owners who are willing to sacrifice public rights upon the altar of their private convenience, but the majority have come to recognise that the society invariably endeavours to act with impartial justice to both sides, and that it will not bolster up a weak or improper case. One happy result of this growing appreciation of the society's principles and practice has been that, during the last few years, it has often been asked to arbitrate between landowners and local authorities in cases of disputed rights of way. In its *rôle* of arbitrator the society has been able to settle hundreds of vexatious footpath disputes to the satisfaction of the public and of the landowners, and at the present time disputes with regard to no fewer than 147 ways are awaiting adjustment at its hands.

By means of friendly settlements of this kind, legal proceedings, with all their attendant friction, expense and dissatisfaction, are avoided. Above all, the bitter memories which follow an unsuccessful footpath fight are avoided, for no feeling is created that might prevails over right.

NEED FOR WATCHFULNESS.

Nevertheless, it is only by incessant watchfulness that our field-paths and woodland tracks are maintained. Gradually, under the care of the society and its branches, footpath maps will cover a great part of the country. But this work is laborious and expensive, and, of necessity, it must proceed slowly and with care. In the meantime the cult for country rambling is growing in response to the facilities offered by rail, omnibus, and tram for rapid and cheap passage to the green fields. This development leads to fresh dangers, for experience has shown that a few irresponsible town-dwellers may render not only themselves, but the rambling community at large, unpopular with farmers when they wantonly trespass or ignorantly damage hay or other growing crops. Privileges appreciated by many may be withdrawn in consequence of thoughtless abuse by a few irresponsible individuals.

It may be, as Mr. Richard Whiteing suggests in his book, "All Moonshine," that the time is coming that the development of aeroplanes will render unnecessary terrestrial tramps, but, as he takes care to add, the Commons Preservation Society will even then find it essential to open a Vault of Heaven branch.

In the meantime it is estimated that there are in this country not fewer than 300,000 public paths. Each one of that great multitude is an asset of rural life, the preservation of which is worthy of some sacrifice. From the hour when the tender green of springtime first appears to the closing months of the year when "autumn's golden arm enfolds the world," the charm of the footpath way acts as a magnet to the man whose heart is open to the touch of Nature. The Commons and Footpaths Preservation Society, as the unofficial guardian of public rights and privileges, may also claim some share of his thoughts and sympathies in its ceaseless efforts to hand on to future generations those highways and byways which are now so great a boon.

BURST WATER PIPES.

LIVERPOOL'S 12,000 LEAKAGES.

The serious effect of the recent prolonged spell of frost upon water undertakings is described in a report presented to the Liverpool Water Committee by Mr. Joseph Parry, the consulting water-engineer to the corporation of that city. Among other things, Mr. Parry dealt with the large increase in the consumption of water due to taps being left open to prevent water freezing in private pipes.

The thaw became pronounced on February 19th, and its effect upon the consumption of water was that it had gone up in the Liverpool area from 248¼ million gallons for the week ended January 27th to 273¼ million gallons, and in the entire area supplied by Liverpool from 288 million gallons to 322¾ million gallons per week. This increase had taken place notwithstanding the fact that since January 12th the supply to over two-thirds of the Liverpool area had been entirely shut off every night to prevent the service reservoirs from being emptied.

The quantity of water delivered to the city had been far in excess of anything previously known, but in spite of this a large number of inhabitants had been deprived of their usual supply. This deprivation had been the result of leakages from private lead pipes and fittings, and from distributing mains broken by the action of frost. The number of leakages from private lead pipes and fittings discovered up to date was 12,000. The vast majority of these were found in outside w.c.'s. The number of leakages stopped from street mains was 198.

This number of leakages discovered and dealt with would have been greatly exceeded and the inconvenience to the public would have been greatly diminished if it had not been for the war. A large number of the most active members of the waterworks staff were absent on military service, and the same cause had prevented the engineer from obtaining the important assistance from other departments of the corporation which had been available on previous frost visitations. The war had thus more than doubled the difficulty of dealing with the situation. Every possible effort was being made to discover and stop the escapes of water, but some time would necessarily elapse before a normal state of things could be restored.

It was reported at the last meeting of the Metropolitan Water Board that, owing to consumers' wasteful practice of leaving taps running day and night during the recent severe frost, the daily supply rose from 234 to 305 million gallons. The chairman (Mr. E. B. Barnard) said that, as it had been suggested the public should be put on rations, it would be reasonable for the board to apply to the authorities to allow them to make regulations to prevent waste.

The Canal Control Committee.—All communications intended for the committee should be addressed to the secretary, Mr. R. B. Dunwoody, 7 Princes-street, Westminster, London, S.W.

Municipal Piggeries. — Municipal piggeries were advocated at a meeting of the Grimsby Chamber of Trade on Tuesday, and it was decided to urge the Grimsby Corporation and the Cleethorpes Council to prepare a scheme to encourage pig-keeping. He suggested that the authorities should erect piggeries, and let accommodation at a nominal figure to persons who would undertake to rear a pig or pigs.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Are the canals in this country coming back to their own again as highways of heavy transport? Does it not seem to be a grievous pity that so many of these canals should be derelict; and will the Government be able to make use of them as they have done with the railways? Are there no difficulties in the way, because nearly all the canals are used by "outsiders," and not by the "owners"?

* * * *

In referring to the objectionable manner in which the Godmanchester Urban District Council recently dealt with an application from their surveyor for an increase of salary, The Surveyor, in the issue of the 23rd ult., asks for an explanation as to why a bonus, or increase of pay, when demanded, is readily granted to workmen in receipt of a weekly wage, whereas if an official, receiving very little, if any, more pay, asks for an increase, there is generally a storm of protest. Is not the answer that in the case of the workman he is probably able to command a certain number of votes, whereas in the case of the surveyor he has only one vote, which he probably never exercises?

* * * *

Is it not highly necessary that a surveyor should be what is known as an "all-round man"? Is not this exemplified in the prompt action taken by Mr. Reginald Brown, the engineer and surveyor to the Southall-Norwood Council, who promptly made himself acquainted with the "potato question," and turned himself into a seed-potato merchant, with the result that the ratepayers crowded to the town hall and purchased more than £400 worth of seed potatoes in one day? Was not this action very commendable, and could it not be copied all over the kingdom?

* * *

Are not the authorities of New York City to be congratulated on their recent action in restricting the height of the sky-scraper buildings so prevalent in that city, and also the area on which buildings are to be erected, so as to allow more open space? Was it not about time that something was done to restrict the erection of these monstrosities, which are bound to mar the appearance of any city?

* * * *

Does it not seem to be almost criminal folly that whilst the human population of this country is put upon war rations we allow, at least, 2,000,000 dogs to eat every year 307,000 tons of food, most of which is fit for human consumption? And is it not all the more astonishing when we consider that the majority of these dogs are worse than useless, and in towns mere foulers of our footpaths?

* * * *

Are there not a large number of municipal pumping stations, electrical generating stations, and similar establishments, to which are attached small fitting shops, in which, in many cases, the engineer-in-charge has some spare time? Could not these shops be used for the turning out of "small parts" for munition purposes and the training of young men, or women, in the neighbourhood in the use of small tools, lathes, &c.?

* * * *

Is it not rather deplorable to read in the *Engineer* of the 23rd ult. that the maximum number of bricks which a British bricklayer will lay in a given time is about one-third of what he can lay, and about one-tenth of what a bricklayer has laid, with a little organisation and assistance? Is it not a trite and well-known maxim that if either a man or a nation are not putting out their best efforts they are doomed to go under?

* * *

Will not one effect of the war be to bring more into popular favour our numerous spas or health resorts now that people cannot go abroad "to take the waters"? Was not this emphasised recently by Dr. R. Fortescue Fox at the Royal Society of Arts in his paper on "The Future of British Spas," in which he gave an interesting account of the medicinal value of the most famous of our thermal, sulphur, and other waters? But why should we continue to call these places "spas," which is merely a repetition of the name of a celebrated Belgian watering-place, Spa? Surely it is possible for someone to invent and popularise a more comprehensive name to distinguish these extraordinary underground water supplies of Nature?

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Batley T.C.—The Sanitary Committee recommend that the borough surveyor, Mr. O. J. Kirby, in consultation with the medical officer of health, should prepare plans and estimates for a disinfecting station on a site other than the one proposed at the sewage outfall works.

Dewsbury T.C.—It is proposed to erect public conveniences in Vicarage-road and Robinson-street.

Dorset C.C.—The Education Committee propose to purchase a site in St. George's-road, Portland, for a new school.

Nottingham T.C.—The Public Baths Committee submitted a report to the town council on Tuesday recommending the purchase of the Turkish baths in Upper Parliament-street for £5,400. The corporation have an interest in the undertaking amounting to £3,700, and the balance of the purchase money would therefore be £1,700. The council agreed to defer the consideration of the report for a month.

St. Austell U.D.C.—With respect to the proposed new hospital the council have approved a site for the building on the high altitude from Tregonissey-road to the Look Out. The ground consists of about two acres.

Southborough U.D.C.—Plans have been prepared for a new public underground convenience.

HOUSING AND TOWN PLANNING.

Hoyland U.D.C.—The Housing Committee recommend that the surveyor, Mr. F. J. Thackray, should prepare plans and specifications of a housing scheme for submission to the Local Government Board.

Whitehaven T.C.—The architect has received instructions to prepare amended plans for a housing scheme.

Worthing T.C.—The borough surveyor, Mr. F. Roberts, has been instructed to prepare plans and provisional estimates for a housing scheme which could be undertaken after the war.

MOTOR TRANSPORT.

Bromley R.D.C.—The hiring of motor vehicles for haulage purposes has been agreed upon. At the last meeting Mr. Small, acting highway surveyor, reported that during the last few months he had experienced great difficulty in carrying out the work in connection with the highways owing to the contractors failing to supply the team labour required.

REFUSE COLLECTION AND DISPOSAL.

West Ham T.C.—The town council have approved a resolution from the Sheffield Corporation declaring that any further depletion of the staff of men employed in removing house refuse was not in the public interest, but fraught with serious danger to the public health.

ROADS AND MATERIALS.

Barrowford U.D.C.—It has been decided to purchase one locomotive tar boiler at a cost not exceeding £21.

Belfast T.C.—The superintendent of works, Mr. H. F. Corlett, submitted a report showing that during the last two years the expenditure on street repairs had been under the estimates to the amount of upwards of £11,000, in spite of the increased cost of materials, labour and cartage. For the current year the estimates for this work were between £6,000 and £7,000 below those of 1915-16. Even with the utmost practical economy it could not be supposed that such large reductions in expenditure could be made without the holding over of a large amount of repair work, which would have to be undertaken in the future, and, although so far nothing had been neglected that would permanently affect the sound repair of existing structures, the time was approaching when it must be seriously considered as to how far the curtailment of expenditure on repairs could be continued without it having a permanently detrimental effect on the roads and sewers.

Croydon T.C.—The Roads Committee reported that they had obtained prices from the present horse hire contractors for six months commencing on April 1st, and that these prices represented an increase over the present prices at the rate of £5,772 a year. The committee recommended that they be authorised to continue to employ the present contractors on these terms. Councillor Smith, the chairman, stated that last year the price for horse, cart and man was 12s. 3d. a day in the Croydon district, this year 16s.; Norwood district 13s., this year 17s. 6d. Horse and man, Croydon, last year 11s. 9d., this year 15s. 6d.; Norwood 13s., this year 17s. 6d. The council approved the recommendation.

Derry No. 1 R.D.C.—An intimation has been received from the Local Government Board that they have fixed a new permanent limit of expenditure on road maintenance of £8,500, an increase of £1,140.

Doncaster T.C.—It has been decided to double the tramway lines between a point in St. Sepulchregate and a point a short distance from the Clock Corner in Baxtergate, at an estimated cost of £1,300. The Balby track is to be doubled after the war at a cost of £10,000.

Drayton R.D.C.—The council have received authority from the Road Board to spend up to £200 upon the repair of Kennel-road, which had been severely damaged by the drawing of timber, less £20, which it was estimated the council would have to spend on the road in the ordinary way.

Eastbourne R.D.C.—The annual estimate of the highways surveyor, Mr. W. Walker, showed a proposed expenditure of £3,271. This the council have resolved to accept, on the understanding that under the present conditions the whole of the work was not likely to be carried out, and that the Highways Committee (with the chairman and surveyor in case of emergency) be authorised to incur expenditure not exceeding in the whole the sum of £2,500 on the maintenance and repair of the district roads during the ensuing financial year, exclusive of any works carried out for, or in conjunction with, any Government department.

East Grinstead U.D.C.—The council have accepted the tender of the Tarmac Syndicate, Limited, to tar-treat the main road within the urban district, at the rate of 2 9-20ths pence per square yard.

Grimsby T.C.—The town council have accepted the offer of a plot of land for the proposed Town Hall-square improvement, and have agreed to carry out the scheme at an estimated cost of £400, of which £200 will be for labour.

Guildford R.D.C.—The council have accepted the tender of Messrs. Angel, Son and Gray for the supply of bass brooms at 36s. per dozen (without scrapers) and 42s. per dozen (with scrapers).

Helston R.D.C.—The surveyor of the south district, Mr. J. Williams, asked what position his men were in with regard to National Service. The men thought they ought to enrol, but he could not possibly spare any of them, as the roads were in a very bad state. The council took no action in the matter.

Manchester T.C.—The Paving Committee in a report state that they have informed the Parks Committee that, in respect of the cost of forming, sewering, paving, flagging, and completing streets alongside public parks and recreation grounds, they are unable to accept responsibility, except where they are legally liable. At the same time the attention of the Parks Committee has been called to a number of accounts rendered to them by the Paving Committee for such expenses which are still unpaid.

Roscommon C.C.—The labour bill in connection with the clearing away of the snow after the late downfall amounted to £1,200.

Truro R.D.C.—For road maintenance purposes it has been decided to allocate £3,500 to the South and North Divisions for the ensuing six months.

Uxbridge U.D.C.—The council have accepted the tender of Messrs. A. C. Holman & Co. for tar-painting the roads.

Woolwich B.C.—The borough council have given their formal consent to the doubling of the London County Council tramway tracks in High-street and Beresford-road, Woolwich, and in Plumstead-road between Beresford-square and Parry-place. The scheme will involve the widening of Plumstead-road, towards the cost of which contributions will be made by the London County Council and (it is hoped) the Ministry of Munitions.

SEWERAGE AND SEWAGE DISPOSAL.

Belfast T.C.—The superintendent of works, Mr. H. F. Gullan, has been instructed to submit a report on defective sewers.

Cuckfield U.D.C.—It was stated that a difficulty in keeping pigs on the sewage farm was that the house refuse frequently contained broken glass. It was resolved to issue an appeal to householders to keep vegetable refuse separate from other refuse.

WATER, GAS, AND ELECTRICITY.

Batley T.C.—It was reported that the Dewsbury and Heckmondwike Water Board had had their attention called to the stoppage of the water supply to Soothill, owing to the defective condition of the mains between Halifax and Thornhill. The mayor (Alderman J. W. Blackburn) said that, having regard to the leaky condition of the Thornhill reservoir, the best plan might be to build a reservoir at the top of Soothill-lane.—The town council resolved that the minimum charges for electric current be increased as follow: Lighting, 25s. per annum; power, 13s. 4d. per quarter; and lighting and power, 13s. 4d. per quarter, exclusive of meter rents.

Belfast T.C.—The city corporation last week decided to increase the price of gas from 2s. 6d. to 2s. 11d. per 1,000 ft., the change being necessitated by the increased cost of materials and wages.

Dewsbury T.C.—As chairman of the Gas and Water Committee, Alderman McCann mentioned recent losses of water caused by the bursting of mains. Alderman Sir Mark Oldroyd took the opportunity of giving a few words of warning as to water consumption. He said the maintenance of the manufacturing industries of the district was absolutely dependent upon the public water supply, as the water now coming down the river could not be used for scouring cloth of any delicate hues, such as were required for military purposes. A failure of the public supply would be an unspeakable calamity, and therefore he asked the committee to call serious attention to the necessity of waste being avoided. Alderman McCann promised that the observations of Sir Mark Oldroyd should have the earnest consideration of the committee, who, however, had been doing their best to prevent avoidable waste.

Fulham B.C.—The Electricity Committee recommended an increase of 5 per cent in charges, owing to the increase in the cost of coal and labour.

Harrogate T.C.—The borough electrical engineer has been authorised to obtain tenders for the installation of steam plant of his own designing which will combine smokeless combustion with the recovery of tar and ammoniacal liquors as by-products.

Haslingden T.C.—It is proposed to hold a conference with the Accrington Corporation on the question of a supply of electricity to Haslingden.

Horsham U.D.C.—It has been agreed that, as from March 31st, the maximum demand rates for electric current supplied be discontinued for both private lighting and power and heating; that a flat rate of 6d. per unit be charged in respect of all current supplied for private lighting, except places of worship and the fire station, which should be supplied with current at the present rates of 5d. per unit and 4d. per unit respectively, and that for all current supplied for power and heating purposes a uniform charge be made of 2d. per unit. It was estimated that the extra revenue which would accrue from these alterations would amount to £650 a year.

Leyton U.D.C.—A deficit of £8,500 is recorded on the working of the electric light department for the past year, and it is estimated that next year the deficit will exceed £7,000.

Leicester T.C.—Alderman Parsons submitted the annual report of the Water Committee, and stated that the loss was being decreased year by year, and he had every hope that before the reserve fund was exhausted the water undertaking would be self-supporting, and would never come on the rates.

Northwich U.D.C.—It has been agreed to complete the laying of the water main at Cotebrook in order to make a connection with a 15-in. main to Northwich.

Rochdale T.C.—Subject to the consent of the Bolton Corporation, it is proposed to consult Mr. W. J. H. Wood, borough electrical engineer of Bolton, on the question of improving the supply of electricity at Rochdale.

Spenborough U.D.C.—It was announced that, as a result of negotiations with the authorities responsible for lighting restrictions, the council would in future be able to give the public more light, and thus minimise to a great extent the possibility of accidents on account of the intense darkness, while at the same time conforming with the instructions under the Defence of the Realm Act.

York T.C.—It was reported that the chief constable, who had control of the arrangements for the lighting of the city, was prepared to allow all the electric lights to be lighted, instead of only a portion. With regard to the districts that used to be lighted with gas, the question of providing temporary electric lamps was referred to the Lighting Sub-Committee.

MISCELLANEOUS.

Belfast T.C.—It was stated by the chairman of the Finance Committee, in the course of his annual statement, that the total amount in the estimates under the heading of cartage (which did not include anything done for the trading undertakings) was over £25,000, an increase of £10,000 upon previous estimates. It might well be worth while, the chairman added, for the city council to consider whether a cartage department might be formed to do this work by direct labour.

Blackpool T.C.—The corporation tramways service is to be extended to Squire's Gate.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

SOUTH-EASTERN DISTRICT.

A meeting of the South-Eastern District of the Institution of Municipal and County Engineers will be held at Heston and Isleworth on Saturday, the 31st inst.

FOR OTHER ADVERTISEMENTS

See End of Paper.

BRAINTREE RURAL DISTRICT COUNCIL.

MATERIALS AND STEAM ROLLING.

The above Council invites Tenders for the Supply of Broken Granite, Best Quality Slag, and Broken Flint, as may be required during the ten months ending March 31st, 1918.

Also for Steam Rolling and Scarifying for a similar period.

Forms of Tender and other information may be obtained from Mr. C. Vernon Bright, Surveyor of Highways, London-road, Braintree, Essex, on receipt of a stamped addressed envelope.

The Council does not bind itself to accept the lowest or any Tender.

Tenders to reach the undersigned not later than March 19th, 1917, properly endorsed under their respective heads.

ALFRED HILLS,
Clerk to the Council.

Council Offices,
Bocking,
Braintree.
March 6, 1917. (3,352)

FOR SALE OR HIRE—Two Llewellin & James "W.B." Superheating Tar-spraying Machines, in perfect condition.

JOSEPH PUGSLEY & SONS, LIMITED.
(3,353) Lawrence Hill, Bristol.

WANTED, about 150 yards Second-hand Unclimbable Iron Fencing, not less than 4 ft. 6 in. high—¾-in. to ⅞-in. bars.

Address—
MR. J. EVANS,
3 Cobham-road,
(3,354) Westcliff-on-Sea.

PERSONAL.

Mr. H. [illegible], surveyor to the Axminster Urban District Council, will shortly resign his position.

Mr. H. N. Hughes has been appointed surveyor and inspector of nuisances to the Tring Urban District Council, the work at a salary of £100.

Mr. James O'Donnell has been appointed by the Cork County Council to the position of temporary assistant surveyor in the Fermoy district.

Mr. B. Wilson, of Guisburn, Yorks., has been appointed surveyor to the Totnes Rural District Council in succession to Mr. H. Vickery, resigned.

Mr. Joseph Connolly, surveyor to the Cashel Urban District Council, has been appointed engineer to the Cashel Rural District Council, at a salary of £70 a year.

Mr. R. W. Heathcote, surveyor to the Ham Urban District Council, has been appointed temporary rate collector to the Hampton Wick Urban District Council.

Mr. B. L. Cornelius, the borough engineer and surveyor's office, Maldon, has been elected an associate member of the Institution of Municipal Engineers.

Mr. F. C. Crimes, surveyor to the Kidsgrove Urban District Council, has received a commission for a [illegible] and will be attached to the Royal West Surrey Regiment.

Mr. H. Davey, one of the surveyors to the Branston Rural District Council, has joined the Forces for road service in France, and his duties have been taken over by his colleague, Mr. M. Froud.

Mr. Frank Latham, borough engineer of Penzance, has been gazetted Second-Lieutenant in the Royal Engineers for active service. Mr. Henry Maddern, of Penzance, will carry on the work during his absence.

Mr. W. B. Chancellor, surveyor to the Barnet Urban District Council, has accepted a commission in the Durham Light Infantry, labour contingent, and the council have agreed to pay him £250 a year during his absence.

Mr. W. G. Longdin, for the last five years municipal engineer of Lahore, Punjab, India, has resigned his position in order to go with the Indian Army. He has been given a commission as Captain, and has proceeded to Basra on active service.

Mr. J. H. Drew, M.Inst.C.E.I., borough surveyor of Grantham, has had his salary increased by £20 per annum to be retrospective as from the date of his appointment—some six months ago. He will receive further increments annually of £25 until a maximum of £350 is reached.

Mr. J. K. Bruce, deputy chief officer of the London County Council Tramways, was on Tuesday appointed [illegible] manager, as from April 1st next, at a commencing salary of £1,250 per year, rising to £1,500 per year. Upon his transfer, the position of deputy chief officer of tramways will be abolished.

Mr. Sidney G. Gamble, senior divisional officer of the London Fire Brigade, has been awarded the King's Police Medal for gallant work in connection with fires caused by enemy aircraft. Mr. Gamble was formerly borough surveyor of Grantham—his native town—and received his present appointment in 1902.

Miss J. C. Hirst, eldest daughter of Mr. R. P. Hirst, borough engineer of Southport, has been awarded the Red Cross decoration of the second class in recognition of her valuable services in connection with the war. She is a member of Queen Alexandra's Imperial Nursing Service, and is stationed at the Military Hospital, Frenchay, Farnham. She is the senior nursing sister.

Mr. G. Bertram Hartley, surveyor to the Alton Urban District Council, has been granted a commission as lieutenant, subject to a labour battalion [illegible] at Plymouth, as our readers are aware, Mr. Hartley has devoted considerable attention to the question of army [illegible] military camps, and has been engaged in connection with the sanitary provision at the large camps under the Aldershot Command.

Mr. T. F. Tuffin, managing director to the Liverpool Corporation, was presented recently by the members of the Housing Committee with a gold medallion, as a token of their friendship, and also to commemorate his 50 years' service with the corporation. In his reply, Mr. Turton stated that the Housing Committee now housed something like 12,000 people under bright and healthy conditions. Out of a total of 5,000 houses only two were vacant, whilst last year out of a rental of £29,000 they only lost £40.

Prof. Miles Walker, professor of electrical engineering at the Manchester Municipal School of Technology, on Monday had his salary increased from £600 to £1,200 a year. It was stated that Prof. Walker had been offered a post at £1,800 a year, but he preferred to remain a professor. Mr. J. Maxwell Garnett, principal of the School of Technology, said Mr. Walker was the most distinguished professor of electrical engineering in this country, and within a few years they would have to offer salaries of £1,000 to £1,500 a year for the right type of men for their work. Prof. Walker was appointed in 1912. He has invented a number of improvements in electrical machinery, and is consulting designer to the British Westinghouse Company.

OBITUARY.

Mr. John Edmund, late sanitary inspector of Hampton Wick, has, we regret to say, just died at Diss, Norfolk, at the age of seventy-one.

Mr. J. C. Midgley, acting town surveyor of Newcastle-on-Tyne, died, we regret to state, on Monday last. A few weeks ago the city engineer, Mr. W. J. Steele, joined the Road-Making Battalion for service in France, and Mr. Midgley was appointed acting town surveyor. For nearly thirty years he had held the position of building inspector under the corporation.

Mr. James Forrest, hon. secretary of the Institution of Civil Engineers, whose name was familiar to English engineers through the lectures which he founded with money subscribed as a testimonial to him by the members, died at St. Leonards-on-Sea on Friday last, at the advanced age of ninety-one years. He first became connected with the institution in 1842 through Charles Manby, the then secretary, under whom he received his professional training, and when the latter retired Mr. Forrest became acting secretary, and afterwards secretary, a post he continued to fill till 1896, when through ill-health he had to retire, and was appointed hon. secretary. A memorial service was held at St. Margaret's, Westminster, on Wednesday.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

APPLICATION FOR LOAN.

Wallasey T.C.—£21,090, supplemental loan in respect of the new town hall.

LOANS SANCTIONED.

Leeds T.C.—£17,128 for the installation of two boilers and other plant at the electricity works.

Northwich R.D.C.—£2,000 for the Lostock sewage disposal scheme.

Electricity Supply at Woolwich.—The Highways Committee of the London County Council propose that arrangements shall be made for an additional supply of electric power in the Woolwich district. The cost of the work, so far as can be ascertained, should not, the committee say, exceed £30,000.

A Galway County Surveyorship.—The Local Government Board, having again refused to accede to the request of Galway County Council to sanction Mr. George Lee, as county surveyor for the East Riding, it has been decided to advertise the position, and appoint Mr. Lee in the meantime.

Deptford and Street Lighting.—At their meeting on Tuesday last Deptford Borough Council agreed to represent to the responsible authorities that, considering the brief period of darkness in May, June, and July, resulting from the daylight saving scheme, it is desirable to dispense with street lighting during these months, except at dangerous street crossings, thereby effecting a considerable economy in fuel and labour.

HOW PETROLEUM HELPS IN THE FOOD PROBLEM.

Bushey Park is now being ploughed up. H.M. Office of Works having entered into a contract with Messrs. Roberts Bros., of Eastwick Park Farm, Great Bookham, Surrey, to plough, cultivate, plant, and harvest about 300 acres of land at Bushey Park and Hampton Court.

Oil tractors, running on the Bowring Petroleum Company's "Empire" Vaporising Oil are energetically at work, and the ploughing of the whole of the acreage contracted for will soon be completed.

The land is to be fenced in with cleft chestnut fencing by the Kent County Fencing Company, of Borough-green, Kent, this work having been arranged by their London agent, Mr. Cecil Clayden, 4-5, Adam-street, Adelphi, W.

The use of oil tractors for this class of work is rapidly increasing all over the country, and has resulted in a distinct boom in the call for "Empire" Vaporising Oil. Fortunately, the Bowring Petroleum Company anticipated the demand, and with commendable foresight have made arrangements for ample supplies to meet these requirements, which are of such national importance to-day.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

GASWORKS ENGINEER AND MANAGER.—March 12th.—Monifieth Town Council. £160 a year, with free house, coal and gas.—Mr. J. Fenton, town clerk, Monifieth, Forfarshire, Scotland.

TEMPORARY ASSISTANT.—March 14th.—Neath Corporation. Mr. D. M. Jenkins, borough engineer, Neath.

TEMPORARY SURVEYOR AND INSPECTOR.—March 15th.—Frinton-on-Sea Urban District Council.—The Clerk, Council Offices, Frinton-on-Sea.

HIGHWAY SURVEYOR AND INSPECTOR.—March 17th.—Swaffham Rural District Council. £120 a year.—Mr. Sydney Matthews, clerk, Swaffham, Norfolk.

MUNICIPAL ENGINEER.—May 1st.—Municipality of Lahore, India. £1,000 £1,600 per annum.—Mr. H. P. Tollinton, deputy commissioner and president, Municipal Committee, Lahore.

SURVEYOR'S JUNIOR ASSISTANT. Weybridge Urban District Council. £75 per annum.—Mr. John S. Crawshaw, surveyor, Council Offices, Weybridge, Surrey.

ACCOUNTANT. Middlesex County Council. £150 a year. Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster, S.W.

ASSISTANT.—City engineer's office, Salisbury Town Council. £104 per annum.—City Engineer and Surveyor, Salisbury.

ASSISTANTS. Surveyor's branch of H.M. Office of Works. Candidates should be experienced in dealing with builders' accounts for day work and measured work.—Apply, stating qualifications, and salary required, to Senior Examining Surveyor, H.M. Office of Works, Storey's-gate, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

SHEERNESS.—March 14th.—For the construction of pumping station buildings and other works, for the urban district council.—The Water Engineer, Trinity-road, Sheerness.

ROTHWELL.—March 19th.—For the various trades in erection of lavatories at the council offices, for the urban district council.—Mr. J. Southwart, surveyor, Rothwell, near Leeds.

Engineering: Iron and Steel.

COVENTRY.—March 12th.—For the supply of cast-iron pipes, lead pipes, solder, and hydrant and valve boxes, for the Waterworks and Fire Brigade Committee.—Mr. J. E. Swindlehurst, water engineer, Council House, Coventry.

MANCHESTER.—March 14th.—For the supply of nine 40-h.p. three-phase slip-ring motors, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall, Manchester.

RHONDDA.—March 21st.—For the supply of house service meters, for the Electricity Committee.—Mr. J. M. Bowman, electrical engineer, Electricity Works, Porth, Glam.

Mechanically Propelled Vehicles.

EDINBURGH.—March 14th.—For the supply of a petrol motor fire engine, for the corporation.—The Firemaster, Fire Brigade Headquarters, Edinburgh.

Roads.

WEST HAMPNETT.—March 12th—17th.—For the supply of surface field flint; pit gravel, fine gravel and binding gravel, and distilled tar. Tenders for tar to be delivered by March 12th, and for road material by March 17th.—Mr. W. D. Rasell, clerk, Rural District Council Offices, 5 South-street, Chichester.

PONTEFRACT.—March 12th.—For the supply of highway materials, for the rural district council.—Mr. G. W. Hobman, clerk, Union Offices, Pontefract.

DEVON.—March 13th.—For the supply of limestone, granite, socketed stoneware pipes, refined tar, hire of steam-rollers, scarifiers, and water-carts, haulage, and hire of team labour, for the county council.—Mr. F. E. Simpson, acting county surveyor (No. 2 Division), 22, Queen-street, Exeter.

LITTLEBOROUGH.—March 13th.—For the supply of flags, kerbs and setts, macadam, and sanitary pipes, for the urban district council.—Mr. G. H. Wild, clerk and surveyor, Littleborough.

PATRINGTON.—March 14th.—For the supply of stone, for the rural district council.—Mr. W. Ingleton, district surveyor, Patrington, Hull.

FLEETWOOD.—March 14th.—For the supply of grit stone setts, flags, limestone macadam, tar, and sewer pipes.—Mr. A. Cottam, clerk, Town Hall, Fleetwood.

TUTBURY.—March 14th.—For the supply of broken granite and limestone, for the rural district council.—Mr. F. Rist, surveyor, Drakelow View, Branstone-road, Burton-on-Trent.

STAINES.—March 16th.—For the supply of granite, tarred macadam and granite chippings, for the urban district council.—Mr. E. J. Barrett, engineer and surveyor, Town Hall, Staines.

ERPINGHAM.—March 17th.—For the supply of road material and team labour, for the rural district council.—Mr. R. Mann, district surveyor, Cromer-road, Holt, Norfolk.

ROTHERHAM.—March 17th.—For the supply of granite, broken granite, broken slag, tarred slag, tarred limestone, concrete flags, Portland cement, gritstone setts and kerbs, and granite setts, for the corporation.—Mr. T. Salvin, acting and deputy borough engineer, Town Hall.

WANGFORD.—March 19th.—For the supply of granite, red broken gravel, and best fine marl, for the rural district council.—Mr. S. W. Rix, clerk.

HAYES.—March 19th.—For the supply of 10,000 gallons (more or less) of refined coal-tar, and for tar-painting 40,000 sq. yds. of highways, for the urban district council.—Mr. D. C. Fidler, surveyor, Council Offices, Hayes End, Middlesex.

BRAINTREE.—March 19th.—For the supply of broken granite, best quality slag, and broken flint, for the rural district council.—Mr. C. Vernon Bright, surveyor, London-road, Braintree, Essex.

ELY.—March 21st.—For the supply of 2,930 tons of granite and 1,050 tons of gravel, for the rural district council.—Mr. F. W. Firby, district surveyor, Sutton, Isle of Ely.

EASTRY.—March 23rd.—For the supply of surface and approved dog flints, and steam rolling, for the rural district council.—Mr. F. S. Cloke, clerk, Salisbury House, Strand-street, Sandwich.

DORKING.—March 24th.—For the supply of broken granite, tarred slag, and hire of steam rollers, for the urban district council.—Mr. S. S. Goldings, surveyor, Council Offices.

CANNOCK.—March 20th.—For the supply of granite blastfurnace slag, tarred blastfurnace slag, kerbs, setts and stoneware pipes, for the urban district council.—Mr. R. Blanchard, engineer and surveyor, Council Offices, Cannock.

Sanitary.

HAMBLEDON.—March 12th.—For the collection and removal of refuse and contents of earthclosets, for the rural district council.—Mr. F. Smallpiece, clerk, 138 High-street, Guildford.

WARSOP.—March 12th.—For the removal of house refuse for the urban district council.—Mr. L. A. Wood, clerk, White Hart Chambers, Mansfield.

SHIPTON.—March 12th.—For drainage works in connection with a sanatory hospital at Shipton, for the East Riding of Yorkshire Hospital Committee.—County Hall, Beverley.

LEXDEN.—March 13th.—For the removal of house refuse, and cleansing closets, for the rural district council.—Mr. E. Bentley Potter, acting clerk, Victoria Chambers, Colchester.

HAWARDEN.—March 14th.—For scavenging in certain parishes for the rural district council.—Mr. H. G. Roberts, clerk, Broughton, near Chester.

DURHAM.—March 14th.—For the removal of house refuse, for the rural district council.—Mr. J. Menzies, sanitary inspector, Avenue House, Shincliffe, Durham.

Stores.

DERBY.—March 12th.—For the supply of bricks, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar and slag, for the corporation.—Mr. John Ward, borough surveyor, Babington-lane, Derby.

LEEK.—March 12th.—For the supply of flags, kerbs, channels, setts, macadam stone and chippings, limestone and slag tar-macadam, Portland cement, stoneware pipes, pitch and oil, scavengers' bass brooms, cast-iron manhole and lamphole covers, galvanised malleable manhole step-irons, and cast-iron gullies and frames, for the urban district council.—Mr. W. E. Beacham, engineer and surveyor, Town Hall, Leek.

STOKE NEWINGTON.—March 13th.—For the supply of mason and paviour's work, carriage of road materials, water post and plumbing work, removal of clinker from destructor, lime and cement, drain pipes, bands, bricks, brooms, tools and castings, hay, straw and provender, for the borough council.—The borough surveyor, Town Hall, Milton-road, Stoke Newington.

SOUTHALL (NORWOOD).—March 13th.—For the supply of granite (Guernsey and Leicestershire), lime (Chalk Cross and grey lime), press cloth, carbolic powder and acid, brooms and dustbins, flints, hoggin and gravel, Sarsen bits, steam rolling and scarifying, etc., for the urban district council.—Mr. Leonard Burge, engineer and surveyor, Town Hall, Southall.

DARLINGTON.—March 15th.—For the supply of stoneware pipes, fire clay, cement, lime, iron and steel, yorkshire flagstones, brushes, disinfectants, granite and tarmac, etc.—The Borough Surveyor and Water Engineer, Town Hall.

BOURNEMOUTH.—March 15th-26th.—For the supply of road and sanitary materials, for the corporation.—Mr. E. P. Dennett, borough surveyor, and the town clerk.

ROTHERHAM.—March 17th.—For the supply of broken granite, broken slag, tarred slag, tarred limestone, granite chips, Portland cement, pitch and creosoted oil, granite setts and kerbs, granite setts, and stoneware pipes, for the corporation.—Mr. T. Sykes, acting chief borough engineer, Town Hall, Rotherham.

HEYWOOD.—March 17th.—For the supply of setts, kerbs (local stone), flags (local stone), earthenware pipes, fluted pipes, taper pipes, traps, gullies, pitch, creosote oil, limestone chippings, Derbyshire limestone, granite and granite chippings, and Portland cement.—Specifications, etc., may be had on application to Mr. J. B. Nuttall, borough surveyor, Municipal Offices, Heywood.

SUTTON COLDFIELD.—March 19th.—For the supply of granite, limestone, gravel and sand, granite kerbs, Yorkshire kerb, Rowley setts, earthenware pipes, cement and lime, iron castings, iron and steel, timber, hardware, oils and paints, and bass brooms, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor, Council House, Sutton Coldfield.

COVENTRY.—March 19th.—For the supply of broken roadstone, broken slag, granite kerbs, granite setts, stoneware pipes, castings and workmen's tools, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor, Council House, Coventry.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

23. Town Planning Institute: Mr. W. Rees Jeffreys on "Road Construction and Improvements by Means of Town Planning Schemes." 6 p.m.
31. Institution of Municipal and County Engineers: North-Eastern District Meeting at Spenborough.

APRIL.

7. Institution of Municipal and County Engineers: Eastern Sub-District (Suffolk Norfolk, and Cambridge) Meeting at Beccles.

APPOINTMENTS OPEN.

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APPLICATIONS are Invited for the Post of Municipal Engineer to the Municipality of Lahore, India.

The engagement to be for a period of five years on a monthly salary of Rs.1,250 (equivalent to £s.1,000 per annum) to Rs.2,000 (equivalent to £s.1,600 per annum), according to qualifications.

Applicants must have thorough experience of civil engineering, particularly of sewerage and waterworks, as well as mechanical engineering, and should hold a diploma of some well-known college of engineering, and must not be under 30 or over 45 years of age.

Applications, which should be accompanied with certificates and references, and a full statement of experience and qualifications, should be sent, under registered cover, to the undersigned, to reach not later than 1st May, 1917.

A candidate selected in England will be given a first-class passage to Bombay and a first-class railway fare to Lahore.

(Signed) H. P. TOLLINGTON.
Deputy Commissioner and President.

Municipal Committee,
Lahore. (3,335)

NEATH CORPORATION.
Wanted Temporary Assistant. Must be ineligible for military service.—Applications, stating age and experience and salary required, and accompanied by copies of not more than three recent testimonials, to be made on or before 14th March, to

D. M. JENKINS
Borough Engineer.

Neath,
S. Wales. (3,345)

WANTED — Temporary Assistant Surveyor and Sanitary Inspector (ineligible for Army). —Applications, stating age, experience, and salary, inclusive of travelling expenses required, together with copies of testimonials, to be sent to

R. J. KNAPMAN,
Surveyor and Sanitary Engineer, &c.,
R.D. Council Offices,
Whiston,
(3,340) Prescot, Lancs.

SWAFFHAM RURAL DISTRICT COUNCIL.
Area, 71,500 acres; population, 7,570.
Highway Surveyor and Inspector of Nuisances Required for the duration of the war. Salary £120 per annum. Application, with particulars of qualifications, and copies of three recent testimonials, to be sent to me the undersigned, by the 17th March, 1917.

SYDNEY MATTHEWS,
Clerk.
Swaffham, Norfolk. (3,350)

The Surveyor

And Municipal and County Engineer.

Vol. LI. MARCH 16, 1917. No. 1,313.

Minutes of Proceedings.

Some Highway Cases. In the current number of Knight's Local Government Reports—a publication which we cordially recommend to the attention of our readers—three cases relating to highway law are recorded. We refer in the first place to the case of the *Abingdon Rural District Council* v. *City of Oxford Electric Tramways, Limited*. This case raised an interesting question in regard to the recovery of expenses for damage done by extraordinary traffic. The rural district council sought to recover a sum of £510 as expenses incurred by them in repairing certain highways, such repairs being necessitated by alleged damage due to the excessive weight and extraordinary traffic of the defendant company's motor omnibuses. By their defence the defendants denied that they had subjected the highways in question to excessive weight or extraordinary traffic, or had caused any damage thereto, and they alleged that the highways had not been properly or sufficiently maintained, repaired, or made up by the plaintiffs to carry the ordinary traffic of the neighbourhood. It was proved in evidence that the company had established a regular daily service of motor omnibuses between Oxford and Abingdon, which passed over the roads in question, and it was held by Mr. Justice Sankey that the cost of repairing the roads was recoverable as expenses due to extraordinary traffic or excessive weight. The case is of more than local interest, as it appears to decide in principle that damages for injuries to highways caused by a service of motor omnibuses between two towns over country roads are recoverable under the Highways and Locomotives Amendment Act, 1878.

In the second case to which we refer (*Hudson* v. *Bray*), the matter came before the High Court on appeal from the Bishop's Stortford County Court, the county court judge having decided in favour of the defendant in the following circumstances: The defendant was a farmer and a tenant of land adjoining a highway. A large elm tree which stood in the hedge of a field and abutted on the highway was blown down during a violent gale and fell across the highway, which at the point in question was below the level of the adjoining land. The tree was of such a size that it took some days to remove, and before its removal could be effected the plaintiffs, in driving along the road in the dark in a motor car, collided with the tree and sustained personal injuries and damage to their car. It was held in the High Court that sec. 72 of the Highway Act, 1835, imposed no obligation upon the defendant either to place a lighted lamp on the tree at night or to place someone there during the day to warn persons passing along the highway of the existence of the obstruction. In the third case—*Nash* v. *Rochford Rural District Council*—the plaintiff was driving along a highway when his horse fell into a hollow, with the result that it was injured. The case depended in the first place upon whether the hole was due to an act of misfeasance—namely, the negligent construction of a drain, as alleged by the plaintiff—or whether it was due to mere nonfeasance. This issue was decided in favour of the plaintiff, and it then became necessary to consider whether the defendants were liable for the misfeasance of their predecessors. Upon this it was held that the defendants were not liable for the misfeasance of a former highway authority, which resulted in damage after their time, as no liability was passed on to the defendants under the Local Government Act, 1894.

* * *

Party Walls. Among the most difficult legal questions with which architects and surveyors have to deal in the course of their professional work are those relating to party walls, and we have no hesitation in saying that the new edition of Mr. A. R. Rudall's work on the subject at the present time will be generally welcomed.* London practitioners are generaly familiar with the special provisions on the subject that are contained in the London Building Act, 1894. These provisions, however, are of a complicated character, and have been the subject of a number of decisions by the courts. Mr. Rudall's work contains a statement of the law and a consideration of the decided cases set out in convenient and logical order, and it will consequently be found of the greatest use to those who are practically interested in the subject. As an example of the difficult kind of question which may be raised under the Act, we may mention the case of *Mason* v. *Fulham Corporation* which arose under sec. 95. In that case it was held by the High Court that, where a building owner raises a party wall and then sells his house, and afterwards an adjoining owner, by altering his premises, makes use of the party wall beyond the use of it made by him before the alteration, the person to be recouped under the provision contained in the latter part of the section is the purchaser or sub-purchaser

* "Party Walls." By A. R. Rudall, Barrister-at-law. Second edition. Price 7s. 6d. nett. London: Jordan & Sons, Limited.

who is in possession of the house at the time that the adjoining owner makes use of the party wall, the words "the building owner at whose expense the same was built" meaning, in the opinion of the court, the building owner or his assigns. Apart from special statutory provisions, such as those which are in force in the Metropolis, the law in regard to party walls is part of the ordinary common law of England. This branch of the subject, too, is treated at some length by Mr. Rudall. He points out that, with regard to ownership and rights of user, the term "party wall" may be used in four different senses—namely (1) a wall of which the adjoining owners are tenants in common; (2) a wall divided longitudinally into two strips, one belonging to each of the neighbouring owners; (3) a wall which belongs entirely to one of the adjoining owners, but is subject to a user or right in the other to have it maintained as a dividing wall between two tenements; and (4) a wall divided longitudinally into two moieties, each moiety being subject to a cross easement in favour of the owner of the other moiety. Each of these cases receives full consideration, and, generally, it may be said that that part of the work which is devoted to the common law on the subject is as comprehensive as that which relates specially to the Metropolis. We have no hesitation in commending Mr. Rudall's book to the notice of those of our readers who are interested in the subject with which it deals.

* * *

The Belfast Electricity Undertaking.

The conference which a sub-committee of the Belfast Corporation has had with Sir John Snell in reference to the electricity station has resulted in a report which, in effect, advises the Tramways and Electricity Committee to utilise to the utmost the present accommodation and equipment, supplemented by an additional pair of connecting cables, at an approximate cost of £500, to be in time for the coming winter. Some such issue was generally expected, as it was recognised that in the present exceptional circumstances it would be virtually impossible to obtain generating machinery to extend the output of the works this year, and almost certainly not in time for the winter of 1918. The difficulties encountered by the corporation in the production of output are such as might be expected to arise in these abnormal times, when excessive demands have been made upon electricity undertakings, and they have occurred elsewhere, notably in large cities where generating machinery is working at the highest possible pressure. Sir John Snell does not countenance the extension of the generating plant at the present station, subject as it is to the great difficulty of circulating water and the additional expense of coal delivery. He advises, however, that the Tramways and Electricity Committee should at once proceed to complete plans for future development, and begin by obtaining expert assistance in choosing the sites for the sub-stations. This is, of course, a consideration of the first importance, having regard as much to what is to be avoided as to what is required. The things that will weigh with the committee will be the present position of mains and feeders, the avoidance of extravagant expenditure in copper, and at the same time the expectation of the development of the local demand and its proper distribution. The report has, apparently, had the effect of reassuring the committee with respect to the power of the existing steam plant to meet present requirements, and also to provide for an adequate reserve. Extra care and attention to the water supply from the river for condensing purposes is recommended, and special emphasis is placed upon the necessity for the bestowal of the greatest skill and attention upon the maintenance of the plant in the most perfect condition, the committee being advised to "spend freely any money deemed necessary to such perfection of maintenance." Taken as a whole, the report is just what we should have expected from such a high authority, and it is to be hoped that the administrators of the Belfast undertaking in being guided by its counsel will be tided over their present unexpected difficulties, and also assisted in their future scheme of reconstruction and expansion.

* * *

Street Cleansing Methods.

The question of the organisation and control of the work of street cleansing has for some time been engaging the attention of the Halifax Corporation, and in order to investigate the matter a special committee was appointed some months ago to visit other boroughs and report. The committee went in the first place to Bradford, where the whole of the paved and macadamised roads are under the direct control of the city engineer so far as repairs are concerned. The work of scavenging, however, is under the direction of the superintendent, who is responsible to a special cleansing committee. In Rochdale, which was also visited, the cleansing of all roads and also the work of repair is controlled by the borough engineer under the supervision of a highways committee. There is unity of control also at Huddersfield, which town is divided into three districts, with a separate foreman to each, the whole work being in charge of the borough engineer. Mr. Lord, the borough engineer of Halifax, who visited these towns with the committee, has made a report on the result of their investigations. In this he points out that at the present time the paved streets and roads in Halifax, which are 67 miles long, and the gullies on the paved streets are swept and cleansed by the health department, whereas any work connected with the branch from a gully to the sewer is dealt with by his department. Again, the macadam roads, of which there are 85 miles, are cleansed and repaired, both as regards the surface and the gullies, by the borough engineer. In Mr. Lord's opinion this is a much more satisfactory arrangement than that by which one department is responsible for cleansing and another for repair, as is the case with paved streets. The definite suggestion made by Mr. Lord is that the work of cleansing should be made a separate department under a superintendent, who should, however, be responsible to the highways committee and not to the health committee. In this connection it is interesting to observe that inquiries made by Mr. Lord show that, out of twenty-two towns, in most cases the whole work is under the borough engineer, and it is believed that in not one single case is it under the medical officer of health. In this opinion, however, the medical officer, as is shown by his report, does not agree. We can only hope that in the discussion which is bound to ensue in consequence of the different views taken by the two departments the view of the borough engineer may prevail, for we are convinced that from the standpoint of efficiency it is the sound one.

* * *

War Improvisation in Sheffield.

Mr. W. J. Hadfield, the city surveyor of Sheffield, has recently made a most interesting report upon the war work of his department. Generally the policy adopted has been to defer works where not imperatively necessary, and where practicable, to repair instead of renewing. The effect of the war on the work of the department may, to some extent at all events, be gauged from the fact that, whereas in normal times the department had a staff of over 1,500 men, the total number of employees, both

temporary and permanent at the present time, is only 700. It has, of course, been impossible to reduce the work of the department in anything like the same ratio. On the contrary, although the normal work has been cut down, much of the saving of labour has been counteracted by special new duties thrown upon the department as a direct consequence of the prevailing war conditions. In commenting on what has been accomplished, our contemporary the *Sheffield Daily Telegraph* points out that few municipal departments will have so many pleasant war memories as that of the city surveyor. The art of expediency has of necessity been brought to a fine pitch. It has been a case of discovering new ways of doing old things. For example, the war has put new tramrails at a premium, and they have become almost prohibitive in price. As a consequence of this the department has had to find a way of using such material as was available, and the difficulty has been solved to a large extent by a process of electrically welding up old rails. Again, the shortage of horses interfered seriously at one time with the efficient cleansing of the roads. After careful consideration the department met this difficulty by introducing new motor sweepers of their own design. Perhaps the most serious question to be solved, however, has been that of roadmaking. Recognising that the war would produce a considerable increase in the cost of all types of road materials, Mr. Hadfield has been conducting experiments in new mediums for road building. For instance, one street which is used by very heavy traffic has been paved with a composition of refuse destructor clinker and bitumen, the result, so far as can at present be judged, being quite satisfactory. Needless to say, in the drastic reorganisation of the work of the department which has of necessity taken place a good deal of female labour has been introduced. Even so, the shortage of men has been a heavy handicap, for much of the work of the department is of so heavy a character that it would be unfair to ask women to attempt it. Mr. Hadfield is to be congratulated on the success with which he has overcome the difficulties of a specially trying period.

* * *

Home-grown Timber.

Now that the question of the timber supply has become so acute as to necessitate the appointment of a Government controller, we may perhaps be permitted to remind our readers that even before the war we called attention in these columns on more than one occasion to the serious urgency of the forestry question in this country. Since the outbreak of war the question has become one of much greater urgency, owing to two principal causes: First, there has been considerable acceleration in the cutting of available timber for war purposes; and, secondly, it has become necessary to restrict the importing of foreign timber in order to economise in tonnage. It is hardly surprising, therefore, that the problem of how to provide from home-grown timber as much as possible of the supplies formerly imported should be very much to the front. On Monday last the question was considered at a conference held at the Surveyors' Institution at the instance of the English Forestry Association. At this conference it was suggested that the present shortage is accentuated owing to a lack of sawing machinery and of labour. The controller of timber supplies had stated that if last year's rate of consumption were to continue we have only four or five months' supply available. Of the suggestions that have been made for remedying the situation the most obvious is that of stringent economy. In addition the increased use of reinforced concrete is advocated, and it has been stated that anything like continuous wood roofing must be stopped, while the making of packing cases and similar articles must be reduced to a minimum. It is evident from the statements that have been made in responsible quarters that the question is one of the most serious that the authorities have to deal with at the present moment, and in these circumstances we urge upon all surveyors the necessity of using timber only in cases where work cannot be postponed, and where no substituted material is practicable.

* * *

Waste Reclamation.

There has been recently issued from the offices of *Country Life* a work of considerable interest by Mr. P. Anderson Graham on "Reclaiming the Waste—Britain's Most Urgent Problem."* The object of the book is stated to be to direct attention to the vast possibilities of waste land reclamation in Great Britain and Ireland. In view of the new necessity for increasing our home-grown food supplies—a necessity which will continue permanently after the war—the subject is one of augmented importance. It is also urgent from every point of view. In the first place, reclamation of waste land means a great addition to the wealth of the country. Then, again, for years to come it would provide healthy work for a large number of men, and it opens up a way for land settlement, which is at any rate free from objection inasmuch as it would involve no dispossession of the skilled to make way for the unskilled, and it would provide every possible variety of holding. The theme of the author is that it is possible to secure remunerative results in the second year, and he points out that after that period crops on the reclaimed wastes in Belgium are as a rule much better than those on land that has been long cultivated. It does not, of course, follow that the conditions in this country would be such as to yield such good results as those which have been obtained in Holland and Belgium. Nevertheless, Mr. Graham's book makes a timely appearance, and in directing attention to the importance of a very pressing after-war problem he has rendered a real service.

* * *

A Proposed Wheel Tax.

In another column will be found a letter from Mr. Horace Wyatt, the secretary of the Association of British Motor and Allied Manufacturers, in which he points out that the editorial note in our issue of last week on the proposal for a wheel tax may give rise to some misapprehension. The fact is that, although the association which Mr. Wyatt represents has had under consideration the means to be adopted for raising money for road purposes after the war, they have not in any way expressed an opinion as to the desirability or otherwise of a general wheel tax. Indeed, the opinion expressed by the association is limited to this—that the heavy taxation of users of motor cars as such should be discouraged, as this tends to limit the extent of the available markets. We regret that our remarks were open to the interpretation that the Association of British Motor and Allied Manufacturers was in favour of the imposition of a wheel tax, and we take this, the earliest, opportunity of removing any misapprehension that may have arisen on the subject in the minds of our readers. The proposal for a wheel tax, however, is undoubtedly favoured in some quarters, and, as we stated last week, it is of so bold and novel a character that we shall be interested to learn the views on the subject of those who look at the question, not from the point of view of road users, but rather as highway engineers.

* "Reclaiming the Waste." By P. A. Graham. Price 3s 6d nett. London: "Country Life," Limited, and George Newnes, Limited.

Street Cleansing Methods.

HALIFAX CORPORATION AND THE QUESTION OF CONTROL.

The question as to whether the Health Committee, the Highways Committee, or a committee specially appointed for the purpose should have control of the work of street cleansing has been engaging the attention of the Halifax Corporation for some time past. In October last a committee, which included Mr. James Lord, M.Inst.C.E., A.M.I.E.E., the borough engineer and surveyor, and Dr. Jas. T. Neech, the medical officer of health, visited Bradford, Rochdale and Huddersfield for the purpose of inquiring into the methods in vogue in those boroughs, and the result of the investigations is presented in a report just issued.

BRADFORD.

The borough engineer states that at Bradford the committee were met by Mr. Ezra Hoyle, chairman of the Cleansing Committee, and Mr. Inger, the street cleansing superintendent, who informed them that the whole of the paved and macadamised roads for carts are under the control of the city engineer. The paved streets and all gullies in those thoroughfares are under the management of the Cleansing Committee for sweeping, with a separate superintendent, but the latter does not sweep or cleanse out the gullies on the macadamised roads. These are under the direct control of the city engineer.

The committee were first shown the patent vacuum gully cleansers, of which the city has two, one built by the Yorkshire Commercial Motor Company, Leeds, cost £750. This empties 220 gullies per day, and has a holding capacity of 800 gallons.

The other was made by the Leyland Motor Wagon Company, Lancashire, and cost about the same, viz., £750. This machine empties 280 gullies per day, and has a holding capacity of 1,000 gallons. There are five men with each machine. When the gullies are emptied with the vacuum a water-cart follows and fills up the gullies so as to ensure these are properly trapped.

They estimate that these gullies cost much less to empty by machine than by manual labour, the average being 2 9d. and 4d. respectively.

There are from 130 to 140 miles of paved roads, and it is estimated that the two machines clean 500 gullies each day.

The Leyland machine is one ton heavier than the Yorkshire Commercial Company's make. This they have had two years, and one set of tyres is not worn out yet.

The paved roads are swept three times a week, and 22,000 gullies are emptied weekly. The sweeping of the roads is made about 12s. 6d. per mile for one sweeping with the motor brushes, picking up, carting away, which is done by small hand carts. These are then loaded into a motor wagon and carried away. The labour in this is from 2s. to 2s. 6d. per mile, and the average mileage for twelve months at a cost of 8s. 11d. per cartload for sweepings which are carted away. For twelve months it is estimated 13,293½ tons are swept by this process, this yielding 18,967 tons of sweepings.

The city engineer has four inspectors, viz., two district inspectors for macadamised roads, one for private improvements department, and one for main sewering department, all directly under the Drainage and Roads or Highways Committee.

There is also a separate team labour department, which is under the management of the Street Cleansing Committee, or Mr. Nicholson, their superintendent. This official finds team labour for all departments except the highways, and for this department the city engineer provides his own, for picking up, repairs, and every other purpose.

ROCHDALE.

At Rochdale the committee were met by Councillor Hoyle, the chairman of the Highways Committee, and Mr. Samuel Platt, the borough engineer. Here there is a mechanical sweeper for the main roads in the town, which both sweeps and washes at the same time. This machine is fitted on a tram chassis, has a water tank affixed to it, and weighs about 20 tons when loaded. It is also fitted with a Gregg's steam engine. The tank holds about 2,000 gallons of water, and runs for about six miles of road per hour. This machine belongs to the Tramways Committee, and is hired out to the Highways Committee.

There is also a motor sweeper for the roads where trams do not run. This machine carries about 100 gallons of water, which lasts 1½ hours and it is estimated that about six miles of road can be covered in that time.

The whole of the street cleansing, both paved and macadamised roads, is under the Highways Committee.

The borough consists of 12,000 acres, and is divided into three districts, with a road foreman to each, and has 147 miles of highways. The centre district, which contains twenty-two miles of road, has the roads swept every night. There are twenty watering-carts and twelve horse brushes in addition to the mechanical brushes.

HUDDERSFIELD.

At Huddersfield the committee were met by the borough engineer, and had a consultation with the mayor and the chairman of the Sewage Committee.

Huddersfield is divided into three districts, with a separate foreman to each, and the borough engineer has charge of both the paved and macadamised roads, also the team labour required for the same.

The roads are swept by hand and the *débris* taken away by horses and carts.

In the course of his report Dr. Neech, the medical officer of health, points out that in Bradford all the cleansing work is done by one committee (except the cleansing of the macadamised roads, which is done by the city engineer), and that the organisation for carrying it out is divided into three departments—viz.: the team labour department, which provides the horses required for all work; the street cleansing department, which attends to the cleansing of the streets; and the destructors department, which carries out the removal of house refuse and its disposal. He adds that in the above organisation there is full provision made which will enable the horses to be changed from heavy to light work, as necessity requires, and such as advocated by him in a former report. The city surveyor, however, is provided with his own team labour.

"In Huddersfield," continues Dr. Neech, "the street cleansing is performed by the Highways Committee, while the removal of house refuse, &c., is performed by the Health Committee.

"In Rochdale the cleansing work is done by a special committee. Both here and at Huddersfield close-fitting lids are provided for the closet tubs during the removal to and fro through the streets. This will considerably reduce the nuisance caused by their removal through the streets, but I am afraid the adoption of this method would be unpracticable in Halifax at present owing to the increased weight that would be added to each load on stiff gradients. It would greatly increase the work of the horses, which is heavy enough already in this department of work. As soon as some suitable method of removing these tubs by motor haulage is adopted this addition could be made with great advantage, and, in fact, it would be quite impossible to apply motor haulage to this work without employing a tightly-fitting cover for the tubs owing to the increased speed of the motors and the nuisance that would be caused thereby without such covers."

In conclusion, Dr. Neech points out that while one town was visited—viz., Huddersfield—where the street cleansing is carried out by the engineer, no visit was made to a town where this work is performed by the Health Committee, though Keighley, where this is done, is near by; further, that conditions vary in different towns, and what might be more suitable for other towns may not be the best and most economical method for Halifax.

BOROUGH ENGINEER'S VIEWS.

In connection with the above a report which was prepared by the borough engineer in the early part of last year is of interest.

Mr. Lord states that at the present time the paved streets and roads in Halifax, which are 67 miles long, and the gullies on the paved streets, are swept and cleansed by the health department, and it a branch

from a gully to the sewer is made up, a notice is sent to his own department for it to be attended to. The macadamised roads, which are 85 miles long, are kept cleaned and repaired by his department, both the surface of the roads and the gullies, and it is necessary on these roads to store the sweepings or scrapings from the surface to use as covering when re-coating with granite macadam or other stone. "In my idea," says Mr. Lord, "this is much more satisfactory than would be the case if one department swept the roads and another repaired them, as is the case with paved streets, because the cleansing of the surface of all the roads and gullies and sewers should be under one head. If they were so, I am sure we could economise thereby. For one reason, the Health Committee, when sweeping the paved roads, sweep the *débris* into the channels, and in many cases swill it down into the gullies, and in time the sewers and gully branches become choked, and this department has to break open the surface of the road to clear them. But even where the gradients of the sewers and drains are good, and do not get choked from the above cause, the *débris* is washed down to the sewage works and has to be dealt with there, which is much more costly than would be the case if it were picked up when swept into heaps and ready to be carted away, rather than have to be taken out of the tanks and carted from the sewage works. If these macadamised roads were placed under the Health Committee it would necessitate a separate gang of men for repairing them, whereas at the present time the majority of the men who sweep do the ordinary repairs, and I have a much better oversight of the work than would be the case if the sweeping was placed under the Health Committee, and repairing under my department, because the number of men required for small repairs in the outer districts would not warrant keeping a foreman to watch over them, and a lot of time would be wasted in walking from one part of the town to another, while the supervision would be duplicated as at present on the paved roads.

"I am quite aware that several alterations are required, and I would suggest that the cleansing be made a separate department under one superintendent; but that superintendent, in my opinion, ought to be under the Highways Committee, then the work of supervising the whole of the surface of the roads, gullies and sewers would be one responsibility. The district could be mapped out with a foreman to each district, but all to be under the cleansing superintendent. If they were placed under the Health Committee, I am sure that more gullies and sewers would be blocked than are at the present time, from reasons above stated.

"Several complaints have been made both to the Health Department and the Health Committee through the Highways Committee and the writer, as to swilling the *débris* down the gullies instead of carting it away, but it does not seem to make any difference and is done frequently to-day; and if this were done on the macadamised roads the sewers would be blocked much more frequently, and it would mean sending out special men to break open the road, to open the gullies, and make good afterwards. In addition to that, as before stated, a gang of men would be required for repairing in the various districts. Money could be saved if the surfaces of the roads, both paved and macadamised, in dry weather were swept with mechanical power; but this could not be done satisfactorily on the macadamised roads in wet weather, as then they require scraping."

Inquiries made by Mr. Lord in twenty-four towns elicited twenty-two replies, showing that in most cases the work is under the borough engineer, and it is his belief that in not one single case is it under the medical officer of health.

Dr. Neech also prepared a report on the question. In his opinion it would be a mistake to separate the street cleansing from the removal of house refuse; the same committee, whichever it is, should, he considers, perform both kinds of work. He urges that in any amalgamation schemes proposed it is usually the larger which absorbs the smaller, and he points out that if the scavenging of the paved streets were taken over by the Highways Committee the opposite would obtain in this case

At the last meeting of the Halifax Town Council a discussion took place on the question dealt with above, and the Special Committee were instructed to give further consideration to the matter, and to investigate the system in practice at Leeds.

TRAFFIC CENSUS APPLIED TO THE DESIGN OF ROADWAYS.*

By D. B. Goodsell.

Assistant Engineer, Department of Public Works, Borough of Manhattan, New York City.

The traffic census is too little known and used, as yet, to be of much service. Nevertheless, it has a place in the design of country roads, and has loomed up recently with a large and important aspect in great cities. In fixing the width of any roadway surface, the number of lines of traffic to be accommodated should be given consideration. The statement has been made that, where a vehicle has to turn off a hard surface of a country road on to an earth shoulder oftener than five times in a mile, it is cheaper and safer to construct the additional width of road surface which may be required.

CLEARANCE AND SPEED.

The amount of clearance which a vehicle must have to pass other vehicles safely depends on the speed. At 10 miles an hour the width of a single line of motor traffic, including clearance, would be about 8 ft., and at fast speeds 9 ft. or more. The additional clearance required by an overtaking car should be considered. When moving at, say, 25 miles an hour, at least 4 ft. of free way should be given the overtaken car, to avoid accident due to unexpected deflection from its course.

In the borough of Manhattan, New York City, a realisation of the necessity for widening the narrow crosstown roadways of the mercantile district and some of the north and south streets took shape in 1911, and has resulted in the widening of fourteen streets and avenues. On all of these streets a ten-hour census of the vehicular and pedestrian traffic was taken. It was found that the maximum number of vehicles per foot of width per minute should not exceed 0·5, nor the maximum number of pedestrians per foot of width per minute 5·0.

CHARACTER OF ROAD SURFACE.

The influence of the percentage of horse-drawn traffic on the kind of pavement, its grade and alignment, should be given weight. Where more than 75 per cent is mechanically propelled, sheet asphalt is, in the opinion of the writer, the pavement *par excellence*; if the traffic is evenly divided into rubber and iron tyres, wood block stands out pre-eminently; while if slow-moving, horse-drawn traffic amounts to more than 50 per cent of the whole, close-jointed granite blocks are eminently satisfactory.

The tractive resistance of various paving materials should, in the opinion of the writer, be given much greater weight than is usually accorded them. Motor trucks, in the cities at least, will soon be in almost universal use, and the consumption of fuel will undoubtedly be carefully examined into, and smooth surfaces demanded for economy of operation.

A few figures as to the growth of the motor truck in New York State are presented. It is estimated that motor trucks travelled over State and county highways in 1915, for forty weeks in the year, 14,700,000 miles, and that those trucks operated 60,200,000 ton-miles.

There were in New York City in 1916 about 21,000 motor trucks, or double the number of 1914.

HOW TRAFFIC CENSUS HELPS.

The traffic census finds its application in the regulation of traffic in large cities where congestion is imminent or actual. The borough of Manhattan has found it necessary to establish twenty-nine streets as one-way traffic streets. A determination of the amount of traffic in all the streets of any section of a city should indicate where a diversion of the flow is desirable. The writer believes that such studies are highly important, to the end that alternate traffic routes may be laid out.

In the borough of Manhattan, the Fifth Avenue Association has influenced traffic on that avenue by encouraging merchants and others to exclude commercial traffic from this distinctly retail mercantile and residential thoroughfare, so that there is now less than 2 per cent of horse-drawn vehicles of all kinds. This association makes its own traffic censuses, and studies traffic conditions quite independently of the city.

The traffic census should include observations as

* Abstract of paper presented at the Annual Convention of the American Road Builders' Association.

to the direction of the flow of traffic, number of vehicles entering from entering side streets, routes of coal trucks and other vehicles wandering cabs, &c., as well as a knowledge of the various classes of vehicles. The points at which the count should be taken are worthy of study.

Uniformity in methods of taking and recording counts and in the assignment of weights is much needed for comparisons in different sections.

WATER FILTRATION AT WORCESTER.

REPORT BY THE CITY ENGINEER.

The city engineer of Worcester, Mr. T. Caink, has prepared a report on the filtration of the city water supply and the pre-filtration storage reservoirs. In this he states that the necessity for constructing large reservoirs for storing river water before filtration for the purpose of improving the quality of the water supplied to the city had been repeatedly urged, Dr. Houston being quoted as the authority for insisting upon this advice. He (the city engineer) had persistently opposed this counsel on the ground that his investigations relating to the typhoid incidence of towns throughout the country proved that such a method of purifying public water supplies was not only very costly, but was inefficient. The investigations showed that towns having large storage reservoirs with but an insufficient filtration plant almost invariably had a large typhoid incidence, whereas towns like Worcester, that possess practically no storage capacity, but which filter their water efficiently, enjoyed a comparative immunity from enteric fever. He had further contended that if it were necessary to free the water entirely from bacilli coli, the only known way to do so was by some method of sterilisation other than, or additional to, filtration. The question of providing large pre-filtration storage tanks for the waterworks formed the main subject discussed by the deputation which waited upon the Local Government Board in connection with the extension of the city boundary, and it was chiefly upon this point that the struggle took place at the Local Government Board inquiry held with reference to the extension, and upon which the success or otherwise of the application mainly turned.

In all these instances Dr. Houston was quoted as the authority for the position taken up by the opposition. That gentleman had recently issued his twelfth report on research work to the Metropolitan Water Board. In that report Dr. Houston describes some experiments with the London water supply extending over the principal part of 1916, from which he draws the conclusion that storage cannot be either economically or efficiently employed as a means of improving the quality of public water supplies, and advocates the passing of the water direct from the river to the filter beds after being dosed with chloride of lime for effecting sterilisation. The following is an extract from the doctor's report: "In the case of London's water supply storage reservoirs are absolutely essential for the purpose of quantity. The policy of the Water Board has been to circulate the river water through the storage reservoirs in order to improve its quality. This involves the expenditure of a large annual outlay as the water in most cases has to be pumped into the reservoirs. An alternative and much cheaper plan, where applicable, is to leave the reservoirs full and pass the river water direct on to the filter beds after it has undergone a process of treatment which purifies it to a higher standard than if stored water were used."

Dr. Houston informed Mr. Caink says the city engineer that when he began his experiment was a patriotic effort to help the country by saving the considerable quantity of coal consumed in pumping the water from the river to the storage reservoirs. But the experiment proved that not only was there a net saving to the Water Board of something like £5,000 a year, but the same quantity of coal saved to the country, but that much superior bacteriological results to the purification of water were obtained, while other important advantages were also secured. The results, he stated, led to make the following observations: "It would not have been justifiable to have carried out the investigation in order to save money if it had involved the slightest risk of injury to the consumer. The investigation, so far from being the case, the treated water being every bacteriologically than Thames water, and in other respects quite unobjectionable."

Mr. Caink says that he thought it might be gratifying to the council to know that the position they assumed on this question of storage in connection with the extension of the city boundary was now confirmed by the very authority upon whose opinion the opposition was based. The sum mentioned by Dr. Houston as saved by the treatment had reference to the cost of pumping into the reservoirs only, but was really a small amount compared with the enormous outlay involved in the construction of the reservoirs themselves. The alternative to the contention of the Water and Sewerage Committee (to whom this report is addressed) would have been either the incurring of an expenditure of upwards of £30,000 in the building of reservoirs, or the sacrificing of the extension of the city boundary. Fortunately the council's contention prevailed.

COAST EROSION IN IRELAND.

WATERFORD COUNTY SURVEYOR'S REPORT ON DAMAGE AT ARDMORE.

A special report on the damage done to the coast at Ardmore by coast erosion was submitted last week to the Waterford County Council by Mr. J. Bowen, county surveyor. Mr. Bowen stated that he had given careful consideration to the works necessary for the protection of the sea wall, the slip, and roadways adjoining. The storms of last November and of the past month caused considerable damage to the walls, too, and slip, while the roadway on top was scoured away for a depth of 3 ft. in places. The existing wall was some 650 ft. long, with a protecting wall about 4 ft. high, and protected by a toe of rubble varying from 12 ft. to 16 ft. wide. The existing works consisted of a series of pieces and patches, with no appearance of any general scheme of co-ordination. There was no attempt at permanence or finality, and the execution of the works left much to be desired. A very considerable and increasing danger, therefore, existed threatening the whole of the sea wall, the roadway on top, the schools, the houses at the east of the village, and the Catholic church. The rapid erosion by the sea to the north of the village threatened to annihilate at an early date the gardens to the rear of the houses of the street and the adjoining low-lying lands. As far as he (Mr. Bowen) could see, there were no other funds other than the rates of the county for the carrying out of any protection works either at Ardmore or at the adjoining coast.

The report specified proposed works to be carried out which would afford reasonable protection, and would be of an entirely permanent nature as far as they went.

Members of the Youghal No. 2 Rural District Council visited the site and fully approved of these proposed works. The estimated cost would be £2,200. At present prices were very unsettled; in the case of materials it was very difficult to form an accurate estimate—a liberal estimate might be totally inadequate a few months hence. The Youghal No. 2 Rural District Council had passed a proposal for this amount subject to its being made a county-at-large charge. The sum did not include the cost of a clerk of works, who would be totally indispensable. Most of the proposed works would be very difficult of execution in bad weather, while another winter's storms on the present works would certainly cause extensive damage.

The chairman said that Ardmore as a centre of historical interest was a very important part of the County of Waterford, and the village had been endangered for a number of years past. It was very urgent that something should be done, and it would only mean a charge of 2d in the pound on the county. He thought that they should deal pretty fairly and liberally with Ardmore without doing anything unreasonable. The Dungarvan Urban Council were contributing to every county-at-large charge, and got no direct benefits at all.

Mr. Whittle: For the sake of the extra £500 I propose now that it be made a county-at-large charge only.

The proposition was passed unanimously.

Street Lighting Economies at Bristol.—It is proposed that none but the arc lamps in the streets of Bristol should be lighted from the first week in April until the end of September. The saving is estimated at £5,000.

The Control of Street Architecture.

ROYAL INSTITUTE OF BRITISH ARCHITECTS DISCUSSION.

Since the war started the Royal Institute of British Architects have dropped their ordinary programme of papers, but this session, in place thereof, a series of informal discussions on various subjects have been held. At the last conference, which was presided over by Sir Aston Webb, the subject dealt with was the Control of Street Architecture.

Sir John Burnet, in introducing the subject, said that at first he was somewhat uncertain as to what was really meant by the control of street architecture; from what he remembered of discussions at the institute meetings it was generally associated with the municipal bodies. Speaking as a practising architect with an essential knowledge of the functions of the officials of those bodies, he could speak of the unfailing courtesy with which, with one or two exceptions, they exercised their functions. He asked what, after all, was control but the recognition by the people of the fact that if the citizen was to enjoy liberty in the erection of buildings, he could only do so on lines which did not curtail the liberty of his fellow-citizen; that the towns should be healthy; that an accidental fire should not put surrounding buildings in peril; that one building should not depend on its neighbour for support; and that in the street all should have equal opportunity. It was obviously the duty of the central authority to secure this. The central authority might find it necessary in the exercise of its duty to widen streets and form open spaces, produce schemes of general improvement, involving consultation with the architect or engineer. The width of streets, and the size of open spaces, and so on, must be subject to some line of control. The general line or character of the street must be fixed, and it was not too much to say that in their selection of advisers, and in the wise discussions of such schemes, the public authorities for the time being had a very great responsibility, as on their decision depended not only the appearance of the town, but the health and happiness of the people. That the local body did sometimes feel that responsibility was shown by the fact that the Edinburgh Town Council in 1757 presented the freedom of the city to Geo. Greig, who designed the lay-out of the new town. Some control there must be, but he would not extend that to empower the local authority to exercise æsthetic control over the street architecture. The width of the street, its plan (straight or curved), its level, length of frontage, and the height to which he would be permitted to build, were all data which the architect recognised must control his design. He did not deny that the freedom he advocated might lead to endless variety, but even a poor design might make a street more human, and be preferred by citizens, from their point of view, to some uniform conception. If in an improvement scheme there was control of the lay-out, and in the design of public buildings, he thought it better that the citizens should be trusted to erect creditable structures with their own architects. Therefore he submitted that the local authority should only make regulations necessary for the health and safety of the people, whilst architects should accept such by-laws as they accepted the requirements of their clients.

Mr. John Murray, dealing with the question from the estate point of view, said that estate conditions imposed on lessees did control the architect to some extent in regard to the design of buildings and the materials to be used. When an architect prepared a design for the lessee of an estate it was discussed with the representative of the estate, and modifications were frequently made. The varied hues which one saw in most streets were due to the fact that the design was prepared for an individual building over which there was no control. He considered that the modern architect, in order to practise successfully, should combine a full knowledge of art, science and finance, as applied to architecture, and the last was not the least essential from the patron's point of view. There were now various new materials awaiting new designs to suit them, and little seemed to be done by architects to solve the problem. He felt that some collective guidance was needed in that respect, and if the matter was taken up by the institute a greater and more universal control could in time be established.

Mr. A. E Richardson attributed the present chaotic state of London streets to the unprecedented prosperity which prevailed in the latter half of the nineteenth century. London did not suffer from poverty of interests, but the general feeling was that it was over-dressed. He suggested that the control and co-ordination of architecture, in so far as it applied to the buildings of London, should be vested in a Government Department, but that a jury consisting of eminent architects, elected annually by the institute, and acting in a honorary capacity, should advise the department on questions of expediency and good taste. In addition to having to satisfy the requirements of the London County Council and the district surveyor, individual architects would submit their proposals to the jury for consideration and recommendation. He considered the fact that the jury would be elected by the members of the institute would ensure smooth working.

Prof. Lethaby thought that control should be carried to the extent of preventing such abuses as plastering walls with dreadful advertisements, and that sort of thing, and also against allowing frontages to become too dirty and run-down. It was their business as collective architects to try and educate the public sense of the citizens. He would like a committee of the institute to walk about the streets and see what they were really like. They might then try and bring pressure to bear to get the railway stations improved, for now they were impossible. They might even make inquiry about the dreadful lamp-posts, and a higher degree of competency should be exacted in all public works. Much might be done to remedy abuses without raising any controversies at all. He trusted that, as the outcome of the conference, a committee would be appointed with a view to improving London architecture.

Mr. Fitzroy Doll said that before much could be done they required more representation in the House of Commons. Speaking with knowledge of estates, he knew the difficulty. The architect designed a building, and the lessee, who might be a boot seller, said he wanted a place where he could show boots, and he did not care about the architect. In the end the estate authorities gave in. There was no harmony in London between the London County Council and the borough councils.

Mr. H. V. Lanchester expressed the view that London was halting between two opinions in regard to architecture. Some favoured the view that where there was a block of buildings in a street they should be modelled as a whole. Others said that individuality must be given a chance, and they could point to towns in Holland and other places with streets where each front was individual and charming in itself. Either ideal could be accepted, but they must make up their minds one way or the other. In some of the Netherlands towns they had the two ideals in vogue in different parts of the towns. He thought, however, if both ideals were accepted they must segregate them, and perhaps that was the best which could be done under the circumstances.

Prof. Adshead considered that the matter was not one altogether for the architect. They had to remember that they were not living in the age of Louis XIV., nor were they an American city with a perfectly symmetrical plan and an absolutely chaotic series of elevations. They had a town which might be described as being originally composed for the most part of acres constructed under an aristocratic *régime*, with consequently a considerable amount of considered compositions. The main issue was whether they ought to attempt to continue under the present democratic conditions any effort to revive compositions for the streets. Personally, he thought they had better rely on a little control.

The Chairman proposed that the council of the institute be asked to take the matter in hand to consider how the views expressed could be best carried out. He considered the matter was one which not only concerned architects but also the public. They had to fix and stir up civic pride among the inhabitants, and he felt that they had a great deal in London to be proud of. He was himself in favour of rather more control over buildings than some of the speakers, as he felt that restrictions, as a rule, were rather helpful than otherwise. They were a stumbling

to them to try and meet the problems put to them. The omitted of the kerbings in streets seemed to him to depend entirely upon the street. In a narrow or irregular street various of design was right, but in a great public thoroughfare certain lines should be laid down by scientific search all who occupied the street should be expert to follow. In a great city like London the capital of the Empire, dignity was more appropriate than picturesqueness.

The resolution was carried.

TROUBLE OVER PAVING SETTS.

HOW A HIPPERHOLME CONTROVERSY ENDED.

A protracted controversy between Hipperholme Urban District Council and the West Riding County Council, in regard to the paving of Bradford-road, has ended (the *Halifax Courier* states), from the financial point of view, in a way satisfactory to the local authority. The condition of the road, though, remains unsatisfactory. From Brighouse to the Hipperholme boundary the road is paved, and from Halifax to the Bradford boundary, so far as the tram track is concerned, it is paved. What the District Council have desired has been to make the paving complete. As far back as 1914 they approached the county council, as the responsible authority, for the necessary permission, and the county council asked for an estimate of the cost. This the district council surveyor furnished, his estimate being roughly £7,000, and the county council gave their sanction to the work being carried out, stipulating, however, for four by five setts, to be approved by their surveyor. Hipperholme Council entered into a contract for setts 6 by 4, claimed to be a better sett, and having the advantage, moreover, of corresponding with the setts used by Halifax Corporation in the maintenance of the adjacent tramway track. There the controversy began. Since, there have been interviews between representatives of the district council and the county council at Wakefield, a deputation and members of the Local Government Board have had the matter under consideration in London, and Local Government inquiries at Wakefield and Hipperholme followed. The verdict of the higher authority has not yet been received.

Tired of waiting, and in the situation that they had £4,000 laid out on setts they were unable to put to use, the district council determined to bring matters to a head. Offers were invited and received for their stock of 6 by 4 setts, showing that they could be disposed of at a profit on the cost price, and intimation was given to the Local Government Board and the county council that they intended to dispose of them unless an assurance was received within seven days that the county council would take over the setts at the price paid for them and pay all charges up to the time of the work being completed. No such assurance was received. Accordingly, at the last monthly meeting of the district council the sale of the setts was proposed and sanctioned, the price received being 4s. per ton, as compared with 7s. 6d. paid.

The enhanced price received clears the council of all charges connected with the purchase and storage of the setts, including bank interest, besides leaving a small margin to the good. Thus, from the financial point of view, the district council have every reason to shake hands with themselves. The fact that the road, meanwhile, has been going from bad to worse is not consoling. For that, however, blame rests, not with the local authority, but with the controlling county body.

Roofing Materials in Hot Climates.—Cement finish [illegible] that roofs are being increasingly adopted in many parts of the world. Perhaps one reason for this being favourably regarded is because experts are not necessary to lay them over the ordinary concrete. We learn that the roof to the surgeons' quarters at Chirbagh, India has been given a 1½-in. Puddled cement topping, and the garrison engineer, Lucknow, has expressed his satisfaction at the result. In hot climates like India cement toppings do not get affected by the intense heat when they are covered with gravel coke breeze, small shells or other [illegible] to counteract the fierce rays of the sun.

CHANGES IN WOOD-BLOCK PAVING PRACTICE.*

By Ellis R. Dutton.
Assistant City Engineer, Minneapolis

In the earliest years so-called experts said that the preservative oil for wood-paving blocks had a tendency to distribute itself through the block, and also insisted on the necessity of extracting all the resin from the wood before treatment. To accomplish this last result, steaming was resorted to. While the expected object was not attained, the practice was in itself good, and is now incorporated in modern specifications for the purpose of preventing bleeding, to secure a proper distribution of moisture throughout the block and to eliminate expansion troubles traceable to the laying of dry wood.

For a while it was thought that the only point worth while paying attention to was the character of the oil, and all discussion turned about the selection of type. But more recently it has been proved that there are a number of oils or tars that are quite suitable for this use. In fact, the specifications adopted by the American Wood Preservers' Association permit the use of water-gas tar, which has no definite relation to creosote.

It has been claimed that the oils used about 1908 would not be stable and remain in the block. In the autumn of 1916 we took up some blocks laid in 1908 and extracted the oil. On comparison with the original oil it was found that the residue above 355 deg. Fahr. was raised 3 points, and the gravity was changed from 1·10 to 1·116. The blocks had lost about 4 lb. of oil per cubic foot, but there was still sufficient remaining in the timber to insure its preservation for a number of years to come. No decay was noted in the pavement.

Experiments have been made in Minneapolis with the so-called non-bleeding blocks, sections of pavement of this type being laid with sand and others with ordinary pitch filler. The sand-filled sections showed almost no bleeding, only a block here and there showing oil on the surface. Blocks laid with bituminous filler, however, were in quite a bad condition as far as bleeding was concerned, but it is thought that this was due to the filler. In this connection there seems to be no difference in action between pitch and asphalt filler.

Expansion joints at right-angles to the kerb line have been given up. These joints were found to be a source of trouble only and served no useful purpose. The angle with the kerb at which block should be laid has been the subject of certain experiments in Minneapolis in 1906. The result indicates that blocks laid at 67½ deg. and at 45 deg. show less trouble from joint wear than those laid at 90 deg. The value of one type or another of a pavement is largely economic. As to maintenance, no pavement is cheaper than wood block. It may be said that the average cost of repairs for the past ten years has not exceeded 0·1 per cent per square yard per year, and there is no question as to the wood-block pavement surpassing all others as to noiselessness and low-traction resistance.

Charing Cross Bridge.—Considerable time was given in the House of Commons on Tuesday to the motion for the second reading of the South-Eastern and London, Chatham, and Dover Railways Bill, one of the chief objects of which is to sanction the reconstruction of the existing Charing Cross railway bridge. Sir W. Essex, who moved the rejection of the Bill, and a number of other members objected to the scheme, holding that the railway station now at Charing Cross should be removed to the south side of the river, as part of a general scheme for the improvement of the part of London affected. A defence of the Bill was offered by Mr. W. Joynson-Hicks, who held that an early strengthening of the bridge was necessary, and that the Bill would not prejudice a future larger scheme. Mr. G. H. Roberts (Parliamentary Secretary, Board of Trade), while sympathising with the desire of Sir W. Essex and the opponents of the Bill for a larger scheme to be ultimately carried out, did not think that such a scheme would be hampered by this Bill being sent to a Committee. The motion for the rejection of the Bill was negatived by 184 to 56, and the Bill was read a second time.

* Abstract of paper submitted at the Annual Convention of the American Road Builders' Association.

Correspondence.

Εἷς ἀνὴρ οὐ πάνθ' ὁρᾷ.

(One man does not see everything.)—Euripides.

INTERCONNECTING ELECTRICITY SUPPLY UNDERTAKINGS.

To the Editor of The Surveyor.

Sir,—You draw attention in your issue of last week to the movement which is in progress in electrical circles towards the reform of electricity supply in this country, by connecting together the generating stations of adjoining authorities, and so securing the advantages of co-operative effort, in the shape of increased reliability of supply at lessened capital cost and with greatly improved economy in working. This movement received a marked impulse from the Board of Trade in May last year, by the issue of a circular letter urging local authorities to link up their undertakings in this way, and since then considerable progress has been made towards the desired end. At the recent conference of authorities in South Lancashire and Cheshire, held under the chairmanship of Mr. G. H. Roberts, Parliamentary Secretary to the Board of Trade, to consider the matter, the speeches of the delegates, both municipal and company representatives, displayed a unanimity in favour of the proposal which drew from the chairman an expression of pleased surprise. The cause of this unusual phenomenon is not far to seek. The war, with its incessant demands for increased output of munitions, has brought about an unexampled demand for motive power which could not possibly have been satisfied without the aid of the electricity supply undertakings, and the advantages of electricity as a means of driving machinery have thus received a priceless advertisement.

It is now generally recognised that a cheap and universal supply of electricity, not only for lighting, but still more for motive power, is indispensable to the prosperity of our industries, and the hard-headed business men of Lancashire have not failed to take the lesson to heart. There was no opposition to the scheme provisionally put before the meeting, which comprised 125 representatives of forty-two undertakings, and the only question at issue was as to the best method of procedure to carry it into effect as soon as possible. It was decided that the committee of engineers responsible for the report on which the proceedings were based should prepare a scheme in detail, and submit it to the Board of Trade, on whose behalf Mr. Roberts—the official in charge of the matter—undertook that it should have the most sympathetic consideration. The conditions which obtain in the areas concerned are particularly favourable to the success of such a project, and we may confidently look forward to important developments in the near future, for Lancashire men do not let the grass grow under their feet.

Not only in the north-west, however, is the question receiving attention; the country has been tentatively divided into districts by a committee consisting of members of the Institution of Electrical Engineers, the Municipal Electrical Association, and the electric power companies, and in several of these areas meetings of supply representatives have been held, and sub-committees formed, to gather information and report. In every case the proposal to link up electricity works has been well received, even in districts where the conditions are not very suitable for this process. The Institution of Electrical Engineers is also about to hold a discussion on the vexed question of wayleaves for electric mains across land in private ownership, a sore point in the electricity supply industry, for in innumerable cases the supply authorities have been put to great expense and loss of time, or have been wholly prevented from carrying out important developments, by the obstructive attitude of landowners. In many cases opposition has been offered even to the laying of underground cables across property, where it could not have the slightest effect upon the use of the land for other purposes. The objections to overhead conductors are more readily understood, but in order to supply electricity to small towns and villages aerial wires afford the only possible means of distribution without excessive outlay, and if such places are ever to share in the benefits of electricity supply, some way must be found to overcome unreasonable obstruction. The question is assuming greater importance as the advantages of electricity in agricultural operations are becoming better understood, and one hardly need point out in these days that every facility must be given to farmers to enable them to increase our food supply.—Yours, &c.,

A. M. I. E. E.

March 14th, 1917.

USE OF STUDS ON ROAD LOCOMOTIVE WHEELS.

To the Editor of The Surveyor.

Sir,—In your issue of 2nd inst., a "Scottish County Road Surveyor," in a sensibly written letter, comments on the damage that will be done to road surfaces by the Local Government Board withdrawing (during the period of the war) the restrictions prohibiting the use of studs in the driving wheels of traction engines engaged in threshing operations, and I desire to corroborate and emphasise some of the points set forth in his letter. It will be in the knowledge of many surveyors that before the war there were frequent infringements of the statute forbidding the use of studs that were often lightly treated, and as a case in point in this district when a threshing engine with spikes travelled over 2 miles of a main tar-macadam road, the owner was simply cautioned, and instructed to arrange with the surveyor that, when travelling in frosty weather, roads may be used on which the least damage may be done.

By the application of sand, when tarred roads cannot be avoided, and taking other roads which are untarred in shifting from farm to farm, movement has been possible with the minimum amount of damage. While the spikes do damage on any kind of surface, the ordinary macadam is least affected, as it in time heals itself up, but the tarred road which has been coated, surface sealed, and made waterproof, with great care and at considerable expense, does not so respond to Nature's touch, as once it is broken it is practically wasted.

Under the new order the studs in the driving wheels are not to be more than 9 in. apart. They must be round-headed, not more than 2 in. or less than 1 in. in diameter, with a projection of not more than 1½ in. from the diagonal bars. Even with these limitations in sizes, such studs will be capable of doing a large amount of damage on a tar-macadam road, as the round head will bruise and burst the surface more than if the stud was more pointed. But, as your correspondent rightly remarks, why this need for relaxing the stud restriction, and allow this road destruction to go on, especially at the present time, when road maintenance should rather be husbanded, because of depleted labour, scarcity of material, together with largely increased traffic? Is there more threshing this year than previously? I think not. The cereal crop of last harvest was not greater than it has been for some years, so that the plea for more frequent travelling in view of alleged increased threshing does not hold good. I can remember when there were far more cereals grown in this district than at the present time, and mostly all threshed by the farm mills.

Since the regular importation of large quantities of wheat began, and grain of all kinds became fairly cheap, farmers turned their attention to the production of other crops, so that of late years there has been less white crop (for threshing) than there was in former years. It may be also interesting to state that in these bygone years when there were more grain crops grown, and before the "big mill" began its peregrinations, every farm did its own threshing, either by water, horse or steam power, and in these days of cheaper and varied forms of driving power, and especially that of the coming farm tractor, there is nothing to hinder a return to the practice of former times (but in a more modern way), when every farm will be provided with its own threshing machine, which can be used by the staff on the farm as circumstances require, instead of awaiting the arrival of the travelling mill.

Tenant farmers are complaining of the high cost of the present system of threshing, owing to extra charges for the use of the mill, the necessity of hired labour, as well as that borrowed from neighbours, and the provisioning for the day of the whole gang. Probably these circumstances may lead to the adop-

[illegible] the simpler and rather first cost the cheaper and better plan for preparing the farm produce for the use of the stock and the grain for the market.

In any case, I trust that this question of the studs will not be lost sight of, and that, in due time, the [illegible] will be restored.—Yours, &c.,

Scottish District Surveyor.

March 12, 1917.

THE IMPORTANCE OF GOOD ROADS.

To the Editor of The Surveyor.

Sir,—I believe your paper is looked upon as the leading one in the question of roads. I have been greatly struck with the terrible condition some of our roads are getting into, and it appears to me that their upkeep in this country is a matter of national importance.

We are informed by the powers that be that agriculture is next to the Army and munitions in importance. There is a very close bond between agriculture and roads, seeing that the raw materials have to be hauled to the farms and the finished products hauled from the farms by road. With the shortage of horses bad roads mean expense and delay, as more horses are necessary to haul loads over bad roads than over good ones.

Then take the order concerning the prohibition of imported timber and the statement that home timber must be felled, for which purpose Canadian lumbermen are being brought over. Does it strike the authorities that after the timber has been felled it must be hauled to where it is required? This hauling must be done over the roads, and those which are weak or in bad repair will not stand the wear of timber hauling.

To me it seems a very short-sighted policy to allow our roads to deteriorate; the upkeep should be a direct war measure.

There is also the question of the increased wear-and-tear of transport, with its consequent additional demand on the resources of factory and repair shop.

During the past few days my attention has been called to the roads in different parts of the country which have been rendered nearly impassable by being knocked to pieces by traffic hauling materials for Government purposes.

I notice in the list of essential trades issued by the National Service Ministry that transport is mentioned, but in the details of transport only motor lorries, steam waggons, tractors, &c., are named. Roads are left out. If motor lorries are necessary, surely the roads on which they must run are equally essential.

In the essential trades I notice granite quarrying is named. I presume this refers only to building granite, but it is not so stated, and as by far the majority of our roads, and practically all those used for agricultural purposes and munitions hauling are granite roads, it seems likely if road granite is really to be considered as "essential," we shall come to the time when food and timber cannot be obtained when they are required owing to the roads being unfit for traffic.—Yours, &c.,

Commonsense.

March 13, 1917.

CONCRETE ROADS.

To the Editor of The Surveyor.

Sir,—I see it is stated that Mr. W. Matthews [illegible] City Surveyor, of Chester, is working to [illegible] the benefit of his fellow men in his practical and exhaustive investigations concerning concrete roads. He [illegible] for the highway engineer to [illegible] overcoming the difficulties of the past. He also refers to the method of [illegible] to the prevention of disintegration which [illegible] is caused by expansion cracks. As a [illegible] of a cement waterproofing [illegible] I have naturally been interested in this subject, and from my investigations I find that the [illegible] have not been successful in [illegible] and contraction of the concrete.

"It is well known that changes in moisture content will cause shrinkage and even cause cracking. There is some evidence that [illegible] in the concrete in winter [illegible] this [illegible]. This expands with frost, and disintegration sets in.

"When water comes into the pores of dried concrete it [illegible] cement clinker, which has not yet been [illegible]. The result is that the concrete is expanded, and the pores filled up, whereupon the action ceases, until the concrete is dried again. Then the concrete once more becomes porous, and on re-wetting the expanding action is repeated."

These are extracts from articles in The Surveyor, the *Building World*, and the *Architect*, published in 1916. Thus it appears feasible that when concrete is made waterproof the disintegration is curtailed.

I have already experimented on a concrete road at King's Lynn with very satisfactory results, but that was to prevent the mud from oozing through the granite setts. The cement rendering was given over the concrete bed and allowed to set before the granite setts were placed in position.

I shall be pleased to give the necessary "Pudlo" (free of charge) to any surveyor who wishes to experiment with waterproofed concrete roads, for I am confident that the results will be beneficial.—Yours, &c.,

J. H. Kerner-Greenwood.

King's Lynn,
March 9th, 1917.

VENTILATION SHAFTS ON PRIVATE HOUSE DRAINS.

To the Editor of The Surveyor.

Sir,—The above heading does not seem to cover the points under discussion, but perhaps you will permit me a roving commission.

We all need some little amusement in these sad times, and I am very glad to have afforded Mr. Smith and his assistant, or collaborator, theirs at such a cheap rate.

The "pretty illustrations" were indeed well done, clever, and, as "Rosyth" claims, self-explanatory. Indeed, I doubt my own ability to equal them, although, as my friends here might say, "That is but faint praise."

The axiom propounded is quite sound; indeed, it is but an addendum to my own. But does bottling up a gallon or so of sewage in a syphon, with a fresh-air inlet placed just over it, and within a few feet of the house door and windows, fulfil those ideal conditions?

My objection to joint drains concerned the tenants only, the owners were not mentioned, who will certainly quarrel as to whose turn it is to clear the top of the gully, for amongst the thousands of housewives there may be a few English women.

I must repeat one paragraph of my original letter, and shall let it rest at that: "(1) Single drains are obviously the best and cheapest. I would omit the yard syphon and fresh-air inlet, inserting instead a 3-in. or 4-in. cast-iron vent pipe square off the drain up each house, if the windows were not in the way, thus ventilating drain and sewer."

Therefore the only adverse criticisms one has to meet—(1) the utilisation of the rain-water pipe as a possible vent, and (2) a long open channel—do not arise.

On one of the many blocks Mr. Smith has under course of erection, why not try the single drain scheme, compare results, and in due course his observations, taking especial count of all those fresh-air inlets, which, in many cases, will be found to be "corked," and most likely being used as flower-pots by grateful tenants.—Yours, &c.,

T. H. Negus.

Coleshill.

THE PROPOSED WHEEL TAX.

To the Editor of The Surveyor.

Sir,—In your issue of March 9th, I note that reference is made to a memorandum issued by the Association of British Motor and Allied Manufacturers, in which the following paragraph appears:—

> "Heavy taxation of users of motor cars as such should be discouraged (*e.g.*, high petrol tax, licence duties, &c.), as this tends to limit the extent of the available markets."

In your comment on this matter you go on to discuss a proposal favouring a wheel tax on all vehicles, both motor and horse drawn, and the reader might fairly infer that this proposal also emanates from this association.

I should be much obliged if you would make it clear that this is not the case. This association has not in any way expressed any opinion as to the desirability or otherwise of a general wheel tax. The only opinion expressed by the association as regards the taxation of road users is contained in the very brief statement quoted above. As it may possibly be assumed that, although no such opinion has been publicly expressed,

this association has privately given its support to a scheme for a general wheel tax, it appears desirable also to state that the advantages and disadvantages of a general wheel tax have not been under the consideration of the association.

I trust that you will make this matter clear in your columns, as it does not appear desirable that this association should be incorrectly supposed to be responsible for, or necessarily favourable to, a proposal which may be regarded with mixed feelings by highway engineers.—Yours, &c.,

Horace Wyatt,
Secretary, Association of British Motor and Allied Manufacturers.

1 Regent-street,
London, S.W. 1.
March 10, 1917.

[We deal with Mr. Wyatt's letter in our editorial columns.—Ed. Surveyor.]

TESTING FACILITIES IN IRELAND.

To the Editor of The Surveyor.

Sir,—Referring to your issue of the 2nd inst., it appears that the chief objection of your Irish correspondent to samples of material from Ireland being tested in England is that many engineers like to see their samples or test pieces dealt with personally. We can only say that such is not our experience, nor do we quite recognise the necessity, given a reliable testing laboratory. Of our numerous London clients, not one in a thousand has ever expressed the desire to see his samples dealt with, even when it only involved crossing the street for that purpose. Your correspondent's view on this point is therefore evidently not shared by the profession generally, and suggests that the large sum he mentions as to cost of travelling to England to see test pieces made, &c., might have been more profitably employed.

With regard to the Cork University Laboratory, we note with very great satisfaction that Prof. Alexander is at the present time engaged in researches on the strength of concrete and reinforced concrete under diverse conditions; we respectfully submit that such researches are essentially the kind of work that should be undertaken by a laboratory attached to a university or other endowed or State-aided institution, instead of what may be termed routine or commercial testing work, in unfair competition with private establishments, especially, as suggested by your correspondent, "at a small fee."—Yours, &c.,

Henry Faija & Co.
(D. B. Butler).

6 Earl-street,
Westminster, S.W.
March 8, 1917.

Professional Men and National Service. It was stated in the House of Commons on Monday that about 4,000 professional men have already been enrolled for national service, and that special arrangements are being made which will give scope for their professional abilities.

Fined for Unauthorised Building.—Summonses were heard at Bow-street on Tuesday against several defendants for having begun and carried on building and construction work at 1 and 2, Coventry-street, without a licence from the Ministry of Munitions. The fines ranged from £25 and costs to £100 and costs.

St. Winefride's Well.—A new development has occurred at the St. Winefride's Well on January 5th, when the famous spring dried up with dramatic suddenness. On Saturday last public notices (says the *Liverpool Daily Courier*) were posted in the town of Holywell of a meeting of ratepayers to be held on Wednesday night to consider and adopt a resolution passed by the urban council to institute legal proceedings against the Halkin District Mines Drainage Company, "subject to an undertaking from other interested parties as to the payment of the agreed portion of costs." The Holywell Urban Council requested the drainage company to receive a deputation from the council on the subject, and the reply of the director was that, "while regretting the apparent drying up of the well, the board could not admit any liability or responsibility in the matter, and therefore no useful purpose could be served by receiving a deputation."

EXTRAORDINARY TRAFFIC IN IRELAND.

THE PROCEDURE UNDER THE ACT OF 1911.

In the Dublin King's Bench Division recently (the *Dublin Express* reports) the Lord Chief Justice sat for the purpose of hearing an appeal adjourned from the Trim Assizes, in which the plaintiffs were the Meath County Council, and the defendant Mr. John M. Wardell, of Celbridge. The appeal was from a decree for £130 granted by the County Court judge for damage alleged to have been caused by the defendant to a portion of the main road from Enfield to Clonee urry. It appeared that the defendant was a contractor to the Kildare County Council for the upkeep of one of their main roads, and that for this purpose he employed a traction engine and wagons to draw road materials over the plaintiffs' road. The plaintiffs alleged that this extraordinary traffic had caused the injury to the road. The defendant contended that the present state of the road was due to the neglect of the county council in not keeping the road in proper repair during the time the traction engine and wagons were passing over it.

The Lord Chief Justice, in giving judgment, said this was an important case for all local authorities. The Act of 1911 enabled county councils, upon the certificate of their surveyor, to claim and recover expenses for injuries to the roads under their charge caused by extraordinary traffic, but it was important to see what it was under the Act of Parliament they were entitled to recover, and what it was the county surveyor had to certify. He had got to certify that extraordinary expenses had become necessary for the purpose of the upkeep of the road, and what the amount of these extraordinary expenses was. That would seem to indicate that this certificate should be given after this expense had been incurred, and it certainly seemed to contemplate that the extraordinary expense so incurred was expense over and above the average of the upkeep that was incurred month by month. His lordship could find no authority for the course that had been adopted in this case by the county surveyor, because it was quite plain upon the evidence that the view the county surveyor had was that he was entitled to allow this extraordinary traffic to continue until the subject matter of the traffic ended, and then to estimate not what extra expense had been incurred, but the capital sum which would be required to put the road back into the condition it had been in at the time the traffic started. If that theory were followed to its logical conclusion, the road might conceivably be rendered practically worthless. It seemed to his lordship that as soon as the local authorities saw substantial injury being caused by extraordinary traffic, it was their duty, in the interest of the ratepayers and also of the travelling public, to incur whatever expense was then necessary for restoring and keeping the road in a fit and proper condition, and if that expense was above the average expense, and the extra expense was due to the extraordinary traffic of Mr. Wardell's traction engine and wagons, then the measure of Mr. Wardell's liability appeared to be fixed by the section, and to amount to the difference between what the county council would require to expend on the normal upkeep of the road and the extraordinary amount they would be compelled to spend by the extraordinary traffic. Unfortunately, in this case that course was not taken, and therefore he was in a great difficulty to ascertain what was the measure in moneys number of Mr. Wardell's liability. Having considered the evidence in the case, the Lord Chief Justice said he would reduce his decree to £60. He would not interfere with the costs below, but would allow each party to bear their own costs of the appeal.

Incorporated Sanitary Association of Scotland.—The forty-ninth annual congress of this body will be held in Glasgow from September 5th to 7th next.

Scavenging Difficulties.—In view of the shortage of labour, Basford (Notts) Rural District Council on Tuesday decided to grant increased remuneration to scavenging. It was stated that the contractor concerned was doing the work himself, and that it would be impossible to get anyone else to carry out the duties.—The Grimsby Sanitary Committee have declined to support the Sheffield City Council in a petition to the Local Government Board for scavenging is to be placed in the reserved occupations list. The Grimsby Committee holding that scavenging is work for old men, and not the able-bodied young

Cultivation of Lands Order, 1916.

By REGINALD BROWN, Surveyor to the Southall-Norwood Urban District Council.

[*Continued from last week.*]

The point is as stated—"Give the lead, and the people will follow." The chief object of the Order is to secure that all land now unoccupied (the first Orders referred to here) should be brought into cultivation by those who are willing and anxious to do so. In growing districts, especially in the suburbs of the Metropolis, there have been hundreds—one might easily say thousands—of acres of land abutting upon streets laid out in the development of estates which from some cause or other have never been built upon, but have lain derelict, and as building land produce no rates.

One must not always, however, blame the owners of such land for allowing it to remain idle; they have not had the money for the erection of houses, and many would gladly have sold the land if they could have found a purchaser; they hoped on for a sale which never took place, and it was this hope that precluded many—but not all—from allowing it to be cultivated.

Allotment holders wanted, naturally, some degree of permanency for the labour expended in preparing the land for cultivation, and the change of sale prevented this permanency being granted. It scarcely pays for an owner of building land to pay even at the rate of £400 per acre and let it out in allotments at the rate of £8 per acre, and even lower. A 2 per cent return is not a very rich investment when one is paying 5 per cent for money borrowed on land. And this is not all—the allotment holders would want the land fenced in, which would be an additional charge on the owner; and, again, would think it very unfair if he had the land only on a short tenancy, and possibly had to give it up just as he had got it into good condition and heart, even although he might have agreed to do so. Certainly the owner, at the rent paid, could never afford to pay compensation for loss of crops; neither could he afford to lose the opportunity for sale if one occurred.

It has been this hope of sale, at any moment, and the expense of fencing, together with the knowledge that directly the land enters into "beneficial" occupation rates will accrue, that has kept these "vacant" lands lying idle. The writer is, of course, quite aware that it is not always due to the causes mentioned—there are always some owners who are not prepared to accept a fair price for land, but will hold out in the hope that the improvement of the district will improve the value of their land, but the scope of these articles will not permit of this side of the question being pursued further.

The difficulty in the way of cultivating land has therefore hitherto been due partly to would-be tenants and partly to the landowners. The necessity of growing food crops has, however, provided a means for getting over the difficulties and the Order of December 8, 1916, made by the Board of Agriculture and Fisheries under Regulation 2 L of the Defence of the Realm (Consolidation) Regulations, 1914, not only provides the means, but at the same time saddles local authorities—with already under-staffed departments—with a considerable amount of detail work. In Southall-Norwood we have the fortunate position of having a large number of so-called *permanent* plots under cultivation, which is an indication of the industrial character of the district. Some private landowners, as well as the [illegible] many years past carried out this work, and the extent of success may be gauged from the fact that in pre-war days we had considerably over 1,000 permanent allotments, of which the district council controlled some 150. Portions of the land occupied by allotments under the jurisdiction of the [illegible] were freehold, others were leased on [illegible] others again were on lands purchased by the council for other purposes, but were [illegible] allotments until they are required for the purposes for which they were bought, while the remainder were on land purchased for housing schemes, the latter lately coming owing to the war. It may therefore be of interest to surveyor readers to indicate the regulations under which these allotments are controlled together with the rents paid. These particulars are as follow:—

SOUTHALL-NORWOOD URBAN DISTRICT COUNCIL.

General Regulations as to Allotments.

(1) The allotments to be called the "Council Allotments."
(2) The plots to be 10-pole plots, unless otherwise agreed by the Council.
(3) The rentals of the allotments may be ascertained on application to the undersigned, and must be paid in advance on the 25th March in each year, or on such date as may be decided upon, of which due notice will be given.
(4) Holders of allotments will receive due notice when their tenancy is to be vacated. The length of such notice, together with conditions attached to same, may be obtained on application to the undersigned.
(5) The Council reserve to themselves and their Surveyor power to enter and inspect the allotments at any time.
(6) Each holder shall properly manure, manage, and cultivate his allotment in accordance with good husbandry, and maintain, and on the termination of his tenancy leave the said allotment in good heart and condition.
(7) Each allotment holder must preserve his allotment stakes uninjured, and keep the path or road on the side of his allotment free from heaps of stones, rubbish, and other incumbrances.
(8) Allotment holders must not erect any building or erection, or fence of any kind on the said allotments without the previous consent of the Council.
(9) Allotment holders must not assign any allotment, or any part thereof, without the consent of the Council, and when an allotment holder leaves the district the allotment held by him will be considered vacant.
(10) Allotment holders desiring to vacate tenancy are expected to give at least one month's notice to the undersigned. Failing notice being received before the 1st March of any year, for the termination of tenancy at the end of that month, the liability for payment for the ensuing year will remain with the registered holder of the plot.

By order of the Council,

Reginald Brown,
Surveyor.

Particulars as to Rentals and Notice.

Rentals.—The rents to be paid at the following rates—viz., 6s. 8d. for 10-pole plot (referred to as permanent plots); 5s. for 10-pole plots (referred to as semi-permanent plots); 3s. for 10-pole plots (referred to as temporary plots)—such rents to be paid in advance on the 25th March in each year, or on such date as may be decided upon, of which due notice will be given.

Notices.—Holders of *permanent* allotments will receive *six* months' notice when the Council require the land, such notice to expire on the 31st December in any year, if possible, and the allotment must be handed over to the Council without any claim on the part of the allotment holder. Should, however, the notice be given so that it expires at any other time, the Council will pay such compensation as may be agreed upon between the allotment holder and the Surveyor of the Council. The holding of "*semi-permanent*" plots is under exactly similar conditions to those specified for permanent plots, except that *three* months' notice only will be given. The holders of *temporary plots* will have as long a notice as possible when it is necessary to terminate their tenancy, but at the termination of their tenancy, in accordance with such notice, the allotment must be handed over to the Council without any claim on the part of the holder.

Council Allotments.

Position of Allotments .....

Address .....

Date .....

Having read the regulations controlling the above, I am willing, and hereby agree, to take up Plot No. ....., subject to such regulations.

Signed .....

Witness .....

In spite of there being so many allotments in the district the cry was for more, and the Cultivation of Lands Order gave the opportunity for securing them. The degree of success attending this, and the detail work entailed—of which the public know very little—can be gathered from the facts that follow. As is well known, the Board of Agriculture have power to enter on any land (*a*) without any consent if the land is for the time being unoccupied, or was unoccupied on November 29, 1916, or if the land was common land; and (*b*) in any other case with the consent of the occupier and the person in receipt of the rent of the land. The board has power to cultivate the land or arrange for its cultivation by any person under a contract of tenancy or otherwise. Anything which the board deems necessary or desirable for cultivating the land or adapting it for cultivation, including fencing, may be carried out either by themselves or by their authorisation. The fencing or work of adaptation if provided may be removed during occupation or at the termination thereof. There is also provision for compensation to both tenants and landowners—to the tenants, if the termination takes place *before* January

The Surveyor
And Municipal and County Engineer.

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1, 1918; to the owner, if the land is injuriously affected. The board has invested certain local authorities with the powers mentioned, these authorities being, so far as London is concerned, the county council and the councils of municipal boroughs and urban districts. Why rural districts have been omitted it is difficult to gather, unless it is that there ought to be ample land in such districts available for the inhabitants without having recourse to compulsory powers to secure it, or because in rural districts there is very little land which may be classed as *unoccupied*. Whatever the reason may be, one knows—only too well—that in many rural villages the inhabitants have very small gardens attached to their cottages, and unless private arrangements can be made with landowners the people are without sufficient land for their use.

The London County Council appears to be the only *county* council invested with the powers of the board, but these have since been curtailed by certain of the Metropolitan boroughs having received similar powers. It needs only "the opinion of the council" that land can conveniently be cultivated by persons residing in the district for the land to be secured. As to what is meant by the word "conveniently" it is difficult to say; presumably it means "without difficulty." For instance, a council would not think of taking unoccupied land which had only 2 in. or 3 in. of soil over a thick bed of free gravel. Neither would they take land which was stiff clay, or covered with rubbish, or low-lying, swampy land, but as the tenancy is a short one and an emergency measure, the best of the unoccupied land would be taken. Lands which cannot be entered upon are gardens attached to unoccupied houses, or pleasure grounds usually occupied with dwelling-houses; neither can common lands be cultivated without special permission of the board. The only obligation attaching to a council is to give notice to the owner, but this need not be until after entry.

(To be continued.)

The Waste of Water. At a meeting of Cavan Urban Council recently it was reported by the surveyor that a burst discovered in the water main had been responsible for a wastage of 1,500 gallons per hour.

DEATH OF MR. GIBSON THOMPSON.

EDITOR OF "THE SURVEYOR."

It is with the deepest regret that we have to announce the death, which took place on Monday morning last, at his residence at Thames Ditton, after a long and trying illness, borne with exemplary patience, of Mr. Gibson Thompson, founder and editor of this journal.

Mr. Thompson, who was fifty-nine years of age, had long been a martyr to ill-health, but it was not until just over three years ago, when it became necessary for him to undergo a surgical operation of a serious nature—followed within a few months by another—that he found himself compelled to abandon his active participation in the work which commenced with the establishment of The Surveyor in 1892. In spite of his sufferings, great as they must have been at times, he preserved to the end the sanguine and buoyant spirit which contributed in no small measure to his success in life, and an unvarying courtesy and charm of manner that endeared him to a host of friends. He leaves a widow and three children—a son and two daughters.

In his youth Mr. Thompson gained an insight into municipal work at Camberwell, where his father was proprietor and head master of St. Mary's College, Hanover Park. He was engaged for some time in the office of the vestry clerk of Camberwell, the late Mr. G. W. Marsden, one of the most experienced municipal officers of his day. In the office of the vestry clerk, then a relatively small department, he had for a colleague the youthful Mr. C. William Tagg, the present town clerk of Camberwell. But young Thompson had other aims in view, and, resigning his position at Camberwell, he proceeded to Portugal and engaged in literary work. Returning to London, he was able to extend his connection with literature, and was the author of many fugitive pieces in various periodicals, notably *Young Folks' Paper*, owned by the late Mr. James Henderson, in which appeared Louis Stevenson's first effort in fiction, "Treasure Island." His more recent works are represented by four contributions to the well-known Homeland series of handbooks—"Wolfe Land," "Westerham and District," "Picturesque Surrey," and "Picturesque Kent."

He commenced the publication of The Surveyor at a time when the reorganisation of local government in this country which resulted in the creation of the modern authorities was not yet completed. From the outset he devoted himself whole-heartedly to the interests of municipal engineering and municipal engineers, and it may fairly be claimed for him that much of the improvement which has since taken place in the status of the members of the profession is due to his at all times fearless criticism and exposure of those abuses with which surveyors have too long been familiar. His death will be mourned by a wide circle, but by none more sincerely than by those with whom he was associated in the production of this journal. Exacting to a degree, he was none the less a kindly and considerate chief, and it is with sad hearts that those who shared his labours for so long bid him farewell.

The funeral took place yesterday afternoon at Thames Ditton, the committal being preceded by a service in St. Nicholas' Church, at which the Rev. B. H. Bosanquet, vicar, officiated. The wreaths included tokens from the Thames Ditton Lawn Tennis Club ("In grateful remembrance of work done for so long by Mr. Gibson Thompson as hon. secretary"), and the directors and staffs of St. Bride's Press ("A last tribute of affection and respect"). The family were represented by Mr. E. D. Ellis (brother-in-law) and Master Langhorne Thompson (son of the deceased), and others present included Mr. H. Percy Boulnois, Mr. E. C. Pinks, Mr. Prescott Row, Mr. Charles Reid, Mr. Charles Mason, and Mr. Horace Mason, the three last-named representing the editorial and business departments of The Surveyor.

AN APPRECIATION.

By the lamented death of Mr. Gibson Thompson the municipal surveyor has lost a good friend. From his conception and launching of The Surveyor twenty-five years ago, his one object was to protect and strengthen the position of surveyors throughout the United Kingdom and his great literary talents

were often brought to bear in this direction. Municipal engineers from the overseas Dominions and abroad frequently wrote to him for advice or assistance in connection with their work, and always came to see him when in this country, for the sake of a chat on all that was stirring in the municipal world. My personal intercourse with the late Mr. Gibson Hargreaves extended over twenty years, and during the whole of that time I found him a courteous and kindly gentleman, always ready to give assistance to those in need, and with a delightful personality. He will be sadly missed. His articles in THE SURVEYOR breathed with sanity. His sense of humour was profound, and stood him in good stead during his protracted illness, and his marvellous courage never failed him until the last. Those who knew him personally will miss him greatly, and will feel that by his death there is a blank which it will be hard to fill. H. P. B.

MUNICIPAL AND COUNTY ENGINEERS.

SPENBOROUGH MEETING PROGRAMME.

We received yesterday the programme of the North-Eastern District meeting of the Institution of Municipal and County Engineers which is to be held at Spenborough, or, to be more exact, Cleckheaton on Saturday, the 31st inst.

Members will assemble at 2.30 p.m. at the offices of the Spenborough District Council at the Town Hall, Cleckheaton, where they will be accorded an official welcome by Councillor J. H. Collier, J.P., chairman of the council.

A paper, entitled "A Few Notes on the Duties of a Surveyor," will be read by Mr. A. Rothera, the surveyor to the Spenborough Council, and other business will include the consideration of a letter from Mr. O. Claude Beeson in reference to the Orphan Fund, and the election of district representatives on the council, and district chairman and district secretary for the ensuing year. The question of future meetings will also receive attention.

At the close of the proceedings the members will be entertained to tea by the chairman of the district council.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

FORTHCOMING INQUIRIES.

MARCH.		£
20	**Purley.** For works of sewerage (Mr. P. M. Crosthwaite) ...	3,350
21	**Hayes.** For works of sewage disposal (Mr. P. M. Crosthwaite) ...	5,500

APPLICATION FOR LOAN.

Bromborough U.D.C. £12,000 for sewerage and sewage disposal works.

LOANS SANCTIONED.

Weymouth T.C. £700 for electric cables and £1,000 for extra gear and boosters.

Enniscorthy U.D.C.—£6,000 for electricity purposes.

Frost and Water Consumption.—It was reported to the Swansea Waterworks Committee that during the recent spell of frost there were no fewer than 5,000 burst boilers and that as a consequence the consumption of water doubled.

Trade Effluent Problems.—The complaint was made by the chairman of the Sanitary Committee, Mr. M. Marsh, at last Monday's meeting of the Ossett Town Council, that large quantities of rags and shoddy material are going down the sewers to the local sewage disposal works. Mr. Marsh said there were tons of the material at the sewage works, and he pointed out that this could be impossible if the manufacturers complied with the regulations as to trade effluents. Mr. S. E. Stocks stated that a former chairman of the committee stated that enough shoddy went down the drains to make every member of the corporation an overall suit of clothes. It was decided to write to the manufacturers on the subject.

ALLOWANCES TO OFFICIALS ON SERVICE.

AN ADJUSTMENT AT BRISTOL.

At the last meeting of the Bristol Sanitary Committee, Mr. Saise proposed the rescission of a resolution of the Finance Sub-Committee granting war allowances to men on active service on the old scale. The Government having increased separation allowances, Mr. Saise proposed (the *Bristol Times and Mirror* reports) that the committee's allowances should be adjusted so that the men did not get more than made up their pre-war wages. The Local Government Board sanctioned only such payment.

Alderman Boyd seconded the resolution, stating that the corporation were treating their men liberally, and it would be wrong to use the ratepayers' money—the poor shopkeepers and the money of the man who got no war bonus—to make the men gone into the Army better off than those who remained at work.

Mr. R. C. Stephens held that the corporation would get the benefit of the extra separation allowance.

Mr. Whitefield and Mr. King were both anxious that the men should not lose the advantage of the extra allowance.

Alderman Boyd said the whole arrangement was that the men's pre-war wages should be made up, and that was to be continued.

Mr. Saise pointed out the corporation would not get the extra money because the War Office would not pay it to them. A sum of £1,500 had been included in the estimate for the next rate, and now that the Government had increased the allowances there was no need for the £1,500; the men would still have all that the committee promised. The Government had in view only the men who had no grants from their employers.

The deputy-chairman stated that the committee arranged to make up the difference between the Army pay and allowances and the men's wages, and that was being done, and it was proposed to be continued. The Government passed an Act to help the men whose employers were not doing anything for them.

The resolution was rescinded by a majority.

MUNICIPAL PIGGERIES.

LOCAL AUTHORITIES' REQUIREMENTS.

At the last meeting of Blaenavon Urban District Council the sanitary inspector reported that an application for permission to keep pigs had been received, but he urged that proper floorings in the sties should be insisted upon by the council.

The chairman said he hoped the inspector would not misinterpret the council's views upon the matter. The council wanted the residents of that district to keep all the pigs they could, and the council would do everything that was reasonable to assist them to do so in regard to the waiving of by-laws.

Dr. Martin urged the council to insist that no sty should be erected until he had been asked to inspect the place.

Mr. Ruther: To talk about concrete floors of a foot thickness is ridiculous. Still, we must act reasonably in regard to the matter.

BOGNOR SCHEME.

The chairman (Mr. H. H. Gibbs, J.P.), at the last meeting of Bognor Urban District Council, moved a report of the Special Purposes Committee recommending the council to keep pigs on the refuse destructor site, and that twelve sties be constructed at an estimated cost of £50, that up to £60 be spent in purchasing pigs, and that the surveyor (Mr. O. A. Bridges) organise the collection of house refuse and waste food. He thought municipal pig-keeping would yield quite a good profit, and that it could be continued after the war.

It was stated that professional advice would be sought on the matter, and the council adopted the report, the purchasing of the pigs to be referred to the Special Purposes Committee.

Liverpool Corporation's Claim.—The Liverpool Corporation are making a claim against the Bootle Corporation for alleged damage to the tramway rolling stock of the city caused by the condition of the tram track in Bootle, for the proper maintenance of which the Corporation of Bootle are said to be responsible.

Law Notes.

Edited by J. B. REIGNIER CONDER, Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of The Surveyor, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

Conversion of Privies into Water-closets: Section 36 Public Health Act, 1875.—"Procedure" writes: Will you kindly advise me upon the questions arising out of the above section, re conversion of privies to water-closets, under the following circumstances: In October last I reported upon the insufficiency, &c., of three privies and the want of proper covered ashpits, and suggested the serving of notice to convert the privies into water-closets (a water supply being available), and provide proper covered ashpits. Authority was given to serve the necessary notice; this was duly carried out, and in December I reported to my council that nothing had been done to comply with the notice, and asked for authority to carry out the works in accordance with the above section, &c., and to recover the cost. A discussion then arose as to the necessity of the requirement, and the medical officer of health was requested to visit the property, and make a report upon the privies in question. His report reads: "I visited this property a year ago, and the privies then were a nuisance. I have recently visited them again, and I see no reason to alter my opinion." To my surprise, the clerk at once advised the council that the notice was out of order, and that they had no power to ask for water-closets; that the Act used the words, "earth-closet, water-closet or privy," and it was for the owner to decide what to do to comply with the notice. I objected to this ruling as being incorrect, but the clerk's reply was that he had looked the matter up very carefully, and was quite satisfied, and should so advise. My contention is that the Act is quite plain, and that the council, having decided the form of closet, &c., to be provided, my notice is fully in order, and that its terms may be enforced; further, that it is for the council to decide the requirements (and plainly set them out), and not the owner.

Subject to any question that may be raised as to the form or wording of the notice, the procedure appears to be in order. Assuming that the council were satisfied, on the report of the surveyor, that the privies were insufficient, they had power, under this section, to require the substitution of water-closets, subject to the right of the owner to appeal to the Local Government Board under sec. 268. See *St. Luke's Vestry* v. *Leary* (26 J.P., 262); *R.* v. *Sherborne Local Board* (*Times*, March 20, 1880); *Nicholl* v. *Epping Urban District Council* (63 J.P., 341). If no such appeal was lodged within twenty-one days after service of the notice, the council have power to do the work and recover the expenses from the owner.

Nuisance: Overcrowding.—"Bookworm" writes: X is a village situate in the rural district of Y, and has a very defective system of sanitation. A considerable number of troops have recently been billeted in the village. The billeting was done by the police and without any regard to health considerations, and the result is grave overcrowding: (1) By an excessive number of soldiers sleeping in small rooms. (2) By the householders themselves whole families, irrespective of sex or age, crowded into one small room. I should be glad to know what powers and steps the sanitary inspector can take to abate the overcrowding, which is really very bad indeed. Coupled with the defective system of dealing with sewage, the prospect is somewhat alarming.

Under sec. 91 of the Public Health Act, 1875, any house or part of a house so overcrowded as to be dangerous or injurious to the health of the inmates, whether or not members of the same family, is a nuisance to be dealt with summarily, as provided by the Act. And under sec. 94, on receipt of information respecting the existence of the nuisance, the council, if satisfied of its existence, must serve a notice on the person by whose act, default, or sufferance the nuisance arises or continues, or if such person cannot be found, on the owner or occupier of the premises, requiring him to abate the same within a time to be specified in the notice. If the notice is not complied with, the person on whom it was served may be summoned before a Court of Summary Jurisdiction, and the magistrates may make an Order for the abatement of the nuisance, and imposing penalties. In the special circumstances of the present case, however, and having regard to the powers of the military authorities, I think it would be well for the council, in the first instance, to communicate with the War Office, calling their attention to the matter, and to the provisions of the Act, and asking them to take steps to remedy the state of things.

Private Street Works: Frontager's Liability Disputed After Final Apportionment.—"Balbus" writes: In a certain private street in this district, which has recently been made up under the Private Street Works Act, 1892, there is a long garden, belonging to a house which fronts on another (public) street. This garden (which is bounded next the private street in question by a high wall) was included in the provisional apportionment, notice of which was duly served on the owner. He gave no notice of objection, and the works were executed and the final apportionment made in due course. Notice of the final apportionment was served upon the owner on January 15th last. Again he gave no notice of objection, and a demand of payment of the apportionment expenses was served upon him on February 26th last. He then, for the first time, repudiated any liability, on the alleged ground that he is not a frontager, because the boundary is not his property, but belongs to another person. I contend, however, that it is now too late for him to dispute his liability, the question being one which could have been raised by way of objection to the provisional apportionment, and disposed of by the magistrates. I shall be much obliged if you will advise me whether I am correct in this view.

In my opinion my correspondent is perfectly correct. Sec. 8, sub-sec. (2), of the Act provides that no objection which could be taken under the Act shall be otherwise made or allowed "in any court, proceeding, or manner whatsoever." And see *Battersea Urban District Council* v. *Walker & Co.* (70 J.P., 199).

Private Street Works. "Garden" writes: There is a new private street in this district which my council propose to make up under the Private Street Works Act, 1892. The street runs parallel to another street which was made up some years ago, and has been taken over by the council. At the back of and belonging to one of the houses fronting on this latter street there is a garden extending to the boundary of the new street, and separated from it by a dead wall. The level of the new street is some 5 ft. below that of the garden, and there is no actual access from the premises in question to the new street, the front and only entrance being from the old street. I shall be obliged if you will advise me whether the premises can be charged with a proportion of the expenses of making up the new street under the Act.

In my opinion the premises are chargeable, and can be included in the apportionment accordingly. See *Paddington Vestry* v. *Bramwell* (44 J.P., 815). The fact of there being no actual access to the street is not material.

Highway: Licence to Dig for Materials for Repair: Costs.—"W. S." writes: A rural council applied to the justices for an order to dig stones in enclosed land under sec. 54 of the Highway Act, 1835. The landowner opposed, but the justices granted a licence for twelve months. Can the justices award costs to the owner's solicitors? There does not seem to be any provision for this in the section referred to.

I do not think the justices have power to award costs to the landowner on granting a licence under this section. There is certainly no provision as to costs in the section itself, and there does not appear to be any provision in the Summary Jurisdiction Acts which would authorise such an award.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

THINGS ONE WOULD LIKE TO KNOW.

Has not the recent death of Mr. James Forrest, the last, secretary of the Institution of Civil Engineers, severed a link with the past? When we realise that, with the sole exception of Telford, he personally knew all the presidents that have occupied the chair since the promotion of the institution, does it not give one some idea of the growth of engineering which Mr. Forrest must have witnessed during his lifetime? Are there not, however, many engineers still alive who can remember Mr. Forrest in his "palmy" days, and his keen interest in the institution, which he practically made what it now is, the most powerful body of the kind in the whole world?

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Shall we follow the example of North Toronto in using brushwood or faggots as a medium for sewage filters? Is it not evident that such a material offers an excellent medium for aërating and oxygenating the sewage, and should it not be a fairly cheap and easy material to procure? But does not the question arise as to how long such a material will last when subjected to such constant wetting, and may it not be found in practice that a more durable material, which has a longer life, will be the cheaper and better medium to use for this purpose? Were not old used-up bedsteads once tried in this country for a somewhat similar purpose, and found to be a failure?

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Was there not something in the complaint of the lady at Bristol, reported in last week's Surveyor, that the dustmen cannot speak the King's English; and is it quite fair to expect that no one can talk properly unless he has enjoyed a college education? Do not some of us begin to wonder whether the millions of money which have been spent in educating "the people" have not been wasted? Do we find, as a result of fifty years' "education," that the "people" are any more articulate, speak English any better, or use fewer swear words in their ordinary conversation? Is not the proof of the pudding in the eating? Where do we see that we have got anything back for the expenditure of these millions of money?

* * * *

Is there anything really practical in electrical agriculture? Shall we not watch with some interest the result of the experiments which are to be carried out at Huntingdon Court Farm, near Hereford, where Professor Blackman will personally superintend the erection of the necessary machinery? Although the application of electric light or electric energy may be able to stimulate plant growth, is it not a question of what will be the extra cost of the plant and power? In other words, will the game be worth the few thousand candle-power which will be required?

* * * *

Are there not too many engineering and kindred societies and associations in this country at the present time, and would it not be a good thing if there could be a federation of all these societies and institutions, with a general engineering council representing the whole? Was not this a good suggestion of Mr. Henry Charles Adams, M.Inst.C.E., in his presidential address to the Society of Engineers about a month ago? Would not some of us be very glad if we could save some of the numerous guineas which we have to pay annually to the various learned bodies to which we are obliged to belong?

* * * *

Will not the correction to "Summer Time" in April help to stimulate the efforts which are now being made by so many people to use all their spare time for the cultivation of potatoes and other vegetables? Is not an extra hour in the evening worth a good deal to those who, for the greater part of the day, are engaged in office work or other sedentary occupations? Does it not seem to be a pity that the late Mr. William Willett did not live to see the fruit of his efforts in the promotion of the "Daylight Saving Bill"?

* * * *

Does it not seem to have been a mistake on the part of the Local Government Board to withdraw the order as to the restrictions prohibiting the use of [illegible] on the driving wheels of road locomotives during frosty weather? While on the one hand it may be argued that it is of the utmost importance that the transport of food produce and munitions should not be interfered with during such weather is there not also the question to be considered of the excessive damage which has been, and will be, caused to the roads by these destructive studs? Is it not better to have good roads for transport instead of almost impassable roads, which may eventually become so bad that traffic on them will be rendered impossible? Besides, is it not possible to employ methods of a more scientific nature in overcoming the trouble of slipperiness?

* * * *

Is it a fact that a would-be patriotic citizen, who is anxious to fill up his spare time by digging in an allotment ground, or even in his own garden, cannot purchase a spade, fork, or other tool for the purpose at a retail shop, but must find out the address of a manufacturer of such articles, and write to him for it? When shall we live in Utopia, where officialdom and red-tape are said to be unknown?

HOUSE REFUSE COLLECTION IN LONDON.

GOVERNMENT ASSISTANCE FOR COUNCILS.

Questioned in the House of Commons in regard to the irregular collection of house refuse in the metropolitan borough of St. Pancras—referred to in our issue of last week—and as to whether the Government would afford the borough council the facilities they have asked for, and the additional labour required to enable them to perform this necessary sanitary function, the Secretary to the Local Government Board said he was fully aware of the difficulties which the Metropolitan borough councils had experienced in this connection, and his department were assisting them in their efforts to surmount these difficulties.

CONVERSION OF REFUSE INTO FUEL.

In the House of Commons the Secretary to the Local Government Board was asked whether his department has had laid before it a scheme for the conversion of house refuse into fuel by any local authority; and, if so, what was the result of the application to the Board? The Parliamentary Secretary to the Local Government Board, Mr. Hayes Fisher, said one application of the kind had been made, but the Board were unable to accede to it. Not only was the proposal an experimental one which had not been put to any practical test, but it involved the provision of machinery, authority for the making of which the Ministry of Munitions would not, as he understood, feel justified in giving.

The Minister of Munitions was asked if a representative of one of the Allied Governments had referred to him a process for the conversion of camp waste into fuel; whether the same process had also been referred to him by the War Office; if so, whether the process had been examined by experts having a knowledge of such matters and the results of such investigation; and whether the inventor of the process had offered to visit any camp, design and supervise the laying down of the first plant, and give the process to the country during the period of the war without any payment or consideration?

Mr. Kellaway, who replied, stated that the process had been most carefully investigated on behalf of both the Ministry of Munitions and the War Office, but it had not been found practicable to adopt it in military camps because it depended upon the inclusion in the material to be treated of food refuse for the advantageous utilisation of which other arrangements were in force.

The Highest Earth Dam.—The Calaveras earth dam, which, when completed, will be the highest earth dam in the world, will contain 3,100,000 cub. yds. of material, will have a height of 240 ft. above bed rock, a crest length of 1,300 ft., and a base width of 1,300 ft. The upstream slope is 1 on 3; the downstream slope 1 on 2½. Practically all the material placed in the dam by hydraulic fill has been pumped. In only one of the eight borrow pits was the elevation sufficient for material to be carried to the dam by gravity. The material placed by hydraulic fill has been carried from 1,300 ft. to 4,500 ft. Two shifts of men per day are worked, the total force is sixty men. With this force an average of 3,600 cub. yds. of material per day has been excavated and placed in the dam, being transported an average distance of 3,000 ft. It is expected that at the present rate of progress the dam will be finished in 1918, and the cost of the work will amount to £500,000.

ELEMENTARY SCHOOL BUILDING.

A CHEAPER TYPE FOR LONDON.

Proposals for the provision of a cheaper type of elementary schools were submitted recently to the Education Committee of the London County Council by the Buildings Sub-committee.

The sub-committee recalled the fact that in July, 1915, they reported that, with a view to making economies in planning and construction of elementary schools, revised preliminary plans had been prepared for the erection of an elementary school in the Stowage, Greenwich, and that the scheme, while complying with the requirements of the Board of Education's building regulations (1914), could be carried out at considerably less cost than the scheme which had already been approved by the committee and the board. The committee decided to submit the revised preliminary plans to the board for approval.

The committee subsequently received the following reply: "The Board notice that the revised plans have been so contrived that none of the class-rooms open off the hall directly, but they do not get the advantage of the cross-ventilation which has been provided in the more recent schools erected by the London County Council. The Board, while regretting the loss of this feature, to which they attach importance, have no doubt that the council on this occasion consider that the advantage must be foregone for reasons of economy. It is suggested that, in order to compensate as far as possible for the loss of the cross-ventilation, the windows should be so constructed as to give the maximum of opening. The plans are returned herewith."

The architect had since carefully reviewed the details of the construction, the statical conditions of the buildings to be provided, and the specification of the materials to be adopted, with a view to arriving at a form of construction which it would be reasonably easy to maintain, without serious additional maintenance charges, for a period of, say, forty years. The committee decided to refer the architect's report to a special section to consider, and they had now received their report. The section had considered in detail the various alternative methods of construction submitted by the architect, and the committee have approved the economies suggested by the section. These were as follows:—

(1) That the condensed planning scheme presented by the architect for the proposed Stowage school, Greenwich, be regarded as generally satisfactory.

(2) That the "drop system" of heating apparatus be adopted in lieu of the "two-pipe system."

(3) That thinner walls, &c., be provided involving a saving on the cost of brickwork.

(4) That Fletton brickwork faced externally with stock and special bricks be adopted in lieu of stock brickwork faced externally with red bricks.

(5) That ornamental brick cornices to elevations be omitted.

(6) That the concrete in floors of class-rooms, halls, and corridors be reduced in thickness and topped with coke breeze concrete, and that ⅞-in. plain flooring be nailed thereto in lieu of the proposed provision of floors with fillets fixed in concrete and 1½-in. grooved and tongued flooring to classrooms and wood-block flooring to halls and corridors.

(7) That stone dressings to entrances be not provided.

(8) That steel and concrete landings be provided to staircases in lieu of York stone landings.

(9) That Delabole slating be provided in lieu of Westmorland slating, and that the scantling of the carcassing be reduced.

(10) That lines and pulleys be provided to windows in lieu of rod window gearing.

(11) That glazed dadoes be provided in the class-rooms, halls, staircases, and corridors, the brickwork above to be fair faced and distempered.

(12) That savings be effected on various small items and also in respect of quantity surveyor's fees due to the reduced cost of building.

(13) That the provisional sum included in the specification for testing floors be omitted.

The sub-committee estimated that if the whole of these recommendations were approved, the cost per head of the main building would be £11 4s. 9d., as compared with £15 15s., showing a nett reduction of £4 10s. 3d. per head, equivalent to a reduction of £4,045 on a standard school of 896 places. They proposed that the amended plans and specification should be adopted as the authorised standard for future elementary school buildings, and they submitted a recommendation accordingly.

The recommendation was agreed to.

HOUSING CONFERENCE AT NEWCASTLE-ON-TYNE.

TOWN-PLANNING AND ARTERIAL ROADS.

A two-days' conference for the North-Eastern Counties on the preparation of housing and town-planning schemes, convened by the National Housing and Town Planning Council, was held in Connaught Hall, Newcastle-on-Tyne, recently. Councillor David Adams, Newcastle, was appointed chairman for the first day, and Alderman Bartlett, chairman of the Health Committee, Durham County Council, for the second day's proceedings.

The delegates were officially welcomed by the Lord Mayor of Newcastle (Councillor George Lunn).

A resolution was passed urging local authorities to appoint housing committees (where these are not already in existence) to make inquiries as to the housing needs of their areas, and where there is a shortage of housing accommodation for the working-classes:

(1) Select suitable land in their areas for building houses for the working-classes, and where such land is not owned by the local authority, secure options for the purchase of the same, such option to be exercised at the close of the war.

(2) Plan out such land on town-planning lines, decide upon the types and designs of houses to be built, have specifications drawn up, and generally make all detailed preparations so that when the time is opportune after the conclusion of the war tenders can be at once invited and the work of building houses started without avoidable delay.

A resolution was also agreed to affirming that the legislation promised by His Majesty's Government in 1913, and again in 1914, with regard to the amendment of the Finance Act of 1909, should be now carried out in order that an admitted obstacle to the building of working-class houses may be removed, and the provision of such houses stimulated at the close of the war.

Mr. N. Dennis, borough engineer, West Hartlepool, proposed, and Mr. J. F. Smillie, borough engineer, Tynemouth, seconded, the following resolution:—

"That this conference, recognising the need for having ready building and other schemes to afford employment at the end of the war, and also the great need for the further provision of houses for the working classes, and recognising further the advantages of building such houses in connection with town-planning schemes, urges upon all local authorities throughout the country the importance of taking the necessary steps to promote and press forward town-planning schemes in their areas."

The proposition was carried after the deletion of the words "need for having ready building and other schemes to afford employment at the end of the war, and also the."

Dr. Hill, medical officer of health, Durham County Council, said he entirely agreed with the resolution. He suggested that local authorities whose surveyors were on active or national service should engage architects to prepare town-planning schemes.

A resolution, moved by Alderman Bainbridge, Stockton, and seconded by Mr. A. J. Rousell, was adopted, requesting the Government to establish a series of district conferences under the auspices of the Local Government Board in order to examine the pressing need for improved arterial roads in the great industrial areas represented at that conference.

Timber, Plywood, and Woodwork.—In next week's issue there will appear a page advertisement which will give various particulars of timber, plywood, and woodwork which Messrs. C. Jennings & Co. have for sale. The page will be found useful for reference by all who make use of such goods. The firm's head office is at Pennywell-road, Bristol, but they have branches at Leicester, Portheawl, and stocks warehoused at Swansea, Hull, Pembroke Dock, Neyland, Newcastle, Manchester, Liverpool, and elsewhere.

Municipal Work In Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Bridlington T.C. A proposal is being considered [illegible] the Promenade for the purpose [illegible]

Dublin T.C. Lara-street public baths and washhouses which have been extensively altered and reconstructed at a cost of £7,000, were formally reopened last week by the Lord Mayor.

Dundee T.C. The alternative schemes for an isolation hospital at Ashcliffe have been referred to a sub-committee of the Poorhouse Committee.

Hinckley U.D.C. The council have agreed to postpone consideration of the provision of workmen's dwellings and the erection of a public mortuary till after the war.

Maidstone T.C.—The town council have resolved to proceed with the scheme of the borough surveyor, Mr. T. L. Bunting, for the erection of a small-pox hospital at an estimated cost of £2,500, provided a loan can be obtained from the Local Government Board.

Merthyr T.C.—Instructions have been given for the preparation of the plans and specifications for a new central public library and the extension of the town hall with a view to an application being made for powers to raise a loan.

Richmond (Yorks) T.C.—It has been decided to construct a new ambulance house at the isolation hospital, in accordance with the plans of the borough surveyor, Mr. H. W. Marsden. The proposed alterations at the town hall, for which a tender has been accepted, are for the purpose of providing an additional exit in case of fire, and it is proposed in the same scheme to improve the lavatory accommodation.

HOUSING AND TOWN PLANNING.

Bristol T.C. The Health Committee will at the next meeting of the town council recommend the purchase after the war of the 500 workmen's houses which the Government propose to build at Avonmouth.

Glasgow T.C. The city council are asking the Local Government Board for a contribution towards the cost of the scheme for building between 20 and 30 tenement buildings.

MOTOR TRANSPORT.

Bradford T.C. The town council are advised to apply to the Local Government Board for authority to raise a loan of £1,600 for the purchase of two steam wagons.

Conway R.D.C.—The surveyor, Mr. R. Hughes, has received instructions to obtain particulars with respect to the cost of steam wagons for carrying stone to the roads.

Nelson T.C. Inquiries are being made as to the possibility of adopting motor traction for road work.

PARKS AND OPEN SPACES.

Newcastle-on-Tyne T.C. It was stated at a meeting of the Town Moor and Parks Committee that out of a total of £18,804 needed for the upkeep of the parks in the present year, £10,098 would be absorbed in the payment of loan charges, rent rates and taxes, and allowances to the dependents of men on active service. The parks cover 270 acres.

REFUSE COLLECTION AND DISPOSAL.

Camberwell B.C. The Works and General Purposes Committee recommend that the contract price for the removal of house refuse be large be increased from 4s. 6d. to 5s. per ton, the allowance to be received by a house during the present abnormal conditions.

ROADS AND MATERIALS.

Chippenham R.D.C. The surveyor stated that since he last met the council he had reviewed the proprietors of the various quarries from whom the council purchase supplies of stone. The prices were all advanced by 6d. to 2s. per ton. In addition to this, none of the quarry owners would guarantee deliveries, in view of the military requisitions and the withholding of railway facilities. The council concluded that it would be a waste of time to make contracts as in past years, and decided to leave the matter to the surveyor.

Dover T.C.—The Road Board have intimated their willingness to make a grant towards the cost of repairing Connaught-road.

East Ham T.C.—Plans and estimates are to be prepared for making up three new roads.

Helston T.C.—The borough surveyor, Mr. J. Heady, has been instructed to prepare an estimate of cost for the repair of Meneage-street.

Meriden R.D.C.—The council have agreed to contribute £50 towards the scheme of the War Department for repairing and resurfacing Irishman's-lane, West Bromwich, and dealing with the surface water.

Portslade U.D.C.—The surveyor, Mr. A. T. Allen, reported as to the heavy military traffic from the goods yard to a neighbouring camp during the past two years which had caused the surface of a portion of Victoria-road to wear down so that the foundation had been penetrated. He had communicated the facts to the Road Board with a view to obtaining a grant, and they had stated that the claim made appeared to be for extraordinary traffic, and had sent certain forms upon which particulars and statistics should be supplied. The surveyor's action was approved, and he was instructed to take the necessary steps to supply the information asked for.

St. Asaph (Flint) R.D.C.—The upkeep of what was termed a "military" road (Bodelwyddan-road) was alluded to when the road surveyor, Mr. J. Lloyd, asked for 50 tons of 1-in. macadam for repairing it. It was stated that £1,052 was spent on the road last year, and the clerk stated that he had applied to the Road Board for a sum of £878 towards this outlay. He had asked that the Road Board should look after the road altogether. He was hoping that the board would do something more, and perhaps that was the reason no money had been received. It was stated by one member that they would never get a good serviceable road fit to take the present heavy traffic unless a proper foundation was put in. Eventually a committee was appointed to view the road.

Staffs C.C. It was reported at the last meeting that the estimate of the expenditure on the main roads worked out at about £83 per mile, an amount just sufficient to keep the roads going as they were. It was decided that able-bodied labourers in the employment of the council should receive a minimum of 25s. a week. It was stated that owing to the increased price of food it was impossible for a man with a family to obtain sufficient nourishment, shelter, and clothing with a less wage. The Rev. W. G. Mayne said he was sorry for the twenty-two men employed by the council on the roads who were not able-bodied, for they had homes and families to keep as well as the able-bodied men.

Swansea T.C.—The town council have adopted an amended plan of the proposed improvement in Temple-street providing for the acquisition of certain premises and an extension of the bank.

SEWERAGE AND SEWAGE DISPOSAL.

Bognor U.D.C. The half-year's estimates adopted by the council last week included a sum of £200 for works of sewerage.

Broadstairs U.D.C.—Included among the after-war schemes of the council is a proposal to drain a new area of the urban district, at an estimated cost of £50,000.

Cheltenham T.C. The town council have agreed to the reconstruction of a storm overflow sewer in Six Chimneys lane with reinforced concrete tubes, at an estimated cost of £200.

Chislehurst U.D.C.—Plans have been approved for additional drainage works at Fallowfields and Frognal.

Clones U.D.C. The Local Government Board wrote that, having regard to the indebtedness of the urban district, they could not, without a local inquiry,

sanction a further supplementary loan of £200 to defray the cost of the sewerage scheme, and suggesting that it be paid out of rates, which was agreed to.

Hackney B.C.—It has been decided to reconstruct the sewer in Retreat-place with 12-in. glazed stoneware pipes.

Hinckley U.D.C.—The Highways and Sanitary Committee reported that the surveyor, Captain E. H. Crump, R.E., who was recently at Hinckley on leave from the front, had submitted a report on the necessity of the provision of additional pumping plant required at the sewage farm, and recommended that a new centrifugal pump, with the necessary piping and valves, be installed as soon as possible at a total estimated cost of £210. It was explained that it was hoped that after this new pump was installed the larger pumping scheme, which was anticipated would have to be installed, would not be necessary for some considerable time.—The recommendation was agreed to.

West Suffolk C.C.—At Monday's meeting of the county council the clerk read a letter from the clerk to the Melford District Council with reference to the refusal of the Highways and Bridges Committee to contribute towards the cost of a sewer and drain at Long Melford on the ground that no portion of the sewer which had been repaired lay under the county main road. The clerk to the Melford Council, in his letter, claimed that under a judgment given by the late Lord Alverstone, the district council was not, under the circumstances, responsible for the expenditure, and that they would not be justified in incurring any expenditure on the road drains, although they might carry a certain amount of sewage matter. —The council referred the matter to the sub-committee for consideration.

Windsor R.D.C.—A drainage difficulty was mentioned in connection with a proposal to take over "Sandridge," Ascot, as a hospital for wounded soldiers. It was stated that two marquees would be erected in the grounds to hold fifty patients, while fifty were to be accommodated in the house, the resident staff numbering ten. Earth closets were to be erected in the grounds. The surveyor (Mr. W. Menzies) said his difficulty would be to get rid of the liquid. The medical officer of health (Dr. J. J. Patterson) said the only feasible way of dealing with the liquid would be a temporary line of pipes and a pump, the liquid to be distributed on some waste land. The council resolved to inform the hospital authorities that it would be impossible to cart the liquid away.

WATER, GAS, AND ELECTRICITY.

Birstall U.D.C.—Prices are to be obtained for resetting two beds to eight retorts at the gasworks.

Bolton T.C.—Estimates have been approved for the installation of a benzol recovery plant at the works in Gas-street, and also for plant for recovering concentrated ammonia, at the Lum-street works.

Chorley R.D.C.—It is proposed to carry out a scheme for a water supply at Coppull, at an estimated cost of £5,400.

Colchester T.C.—It has been resolved to build a new generating station at Hythe, and to obtain quotations for a new motor-alternator for the power station and a new main.

Halifax T.C.—The Tramways and Electricity Committee recommend that application be made to the Local Government Board for sanction to a loan of £10,000 for the provision of a new boiler and economiser at the electricity works.

Kirkcaldy T.C.—The Tramways and Electricity Committee are recommending the corporation to apply for a loan of £27,000 for the extension of the generating station.

Liverpool T.C.—At a meeting of the Water Committee on Tuesday, Mr. J. Parry, the city water engineer, reported that during the recent severe weather altogether 20,800 leakages were dealt with. Everything was being done that could be done to reduce the inconvenience to householders, but it could not be too clearly understood that in the face of an exceptionally high consumption caused by a severe frost or by a long drought, no full and satisfactory supply could be given until the pipe extensions, which had been under consideration for some years, were carried out. For several weeks all the water that the existing pipes between Prescot and the city could carry had been brought in. The laying of new mains from Prescot was stopped by the war, as also the provision of a new reservoir for the south-end, for which the committee acquired land in 1909. It would be necessary, probably for several weeks, to shut off the water all night and occasionally during the day over a considerable part of the city before a constant service could be restored. Those districts which included military and other hospitals, munition works, and important trade consumers were always kept on, and the fire mains were always fully charged. To accomplish that a reserve supply had to be retained in the service reservoirs in and around the city.

Loughborough T.C.—The town clerk reported that the Local Government Board had sanctioned the raising of the loans for the electricity undertaking, the application for which was only made a fortnight ago. The periods of repayment for the three loans averaged 18·4 years, which was over a year longer than they had expected, and would improve the position in regard to sinking fund payments. In reply to Councillor Stenson, the town clerk said the Local Government Board had sanctioned the loans without holding an inquiry, and had agreed to the urgency of the whole matter.

Mexborough U.D.C.—The council are considering a scheme for the extension of the electricity works, at an estimated cost of £10,000.

Oswestry T.C.—An estimate is to be prepared of the cost of laying an additional 7-in. water pipe from Rhydycroesau to Penygwely.

Prestatyn U.D.C.—The council have agreed to a committee's recommendation to advance the price of gas 6d. per 1,000 cub. ft.

Richmond (Yorks) T.C.—Owing to the increased population and improvements to the sanitary arrangements, the water supply is found to be inadequate, and the corporation have therefore decided to construct an additional reservoir, and have instructed the borough surveyor, Mr. H. W. Marsden, to prepare plans and full particulars for carrying out the work.

Seaford U.D.C.—The Seaford Gas Company have advanced the price of gas by 6d. per 1,000 cub. ft. (making the standard price 5s. 1d. per 1,000), which is equal to an advance of 5¼d. to the council, thus making the present price 4s. 6¼d. nett.

Stockport T.C.—It has been decided to put in additional plant at the electricity works.

Todmorden T.C.—The town council have approved a scheme for the provision of new electrical plant, at an estimated cost of £10,000.

Walsall T.C.—The Gas Committee have decided to allocate £4,000 in relief of rates out of the current profits of the gas undertaking.

Worcester T.C.—It is proposed to effect an extension of the water main, at an estimated cost of £420.

MISCELLANEOUS.

Hove T.C.—It was reported by the Works Committee that the tender for horse hire recommended for the ensuing year was £1,000 in excess of what had been previously paid, and a councillor remarked that the council were fortunate to get a tender at the figure quoted.

Middlesbrough T.C.—The General Purposes Committee report in favour of the purchase by the corporation of the Teesside tramways system, provided a satisfactory agreement can be arrived at.

Scarborough T.C.—The town council have agreed to alter the standing orders so that in future any expenditure under £500 should be paid out of revenue, and that on any application to borrow any sum not exceeding £1,000 the loan should be spread over a period of ten years, instead of twenty or thirty years as in the past. Alderman Rowntree said the object was to save interest, and make the council more careful in incurring expenditure.

FOR OTHER ADVERTISEMENTS
See End of Paper.

CUDWORTH URBAN DISTRICT COUNCIL.

Tenders are invited for the Supply of Tarred Slag during the year ending 31st March, 1918.

Further particulars and Form of Tender may be obtained from the undersigned.

Tenders to be sent in on or before Tuesday, April 3rd, 1917.

W. T. LYNAM,
Surveyor.

Council Offices,
Cudworth,
Near Barnsley.
March 14, 1917.

(3362)

PERSONAL.

Mr. Kilbride, B.A., of Springtown, Granard, has been appointed an assistant county surveyor of Cavan.

Mr. Wm. Pallister, surveyor to the Darlington Rural District Council, has been posted to a Lieutenancy in one of the Road Construction Companies.

Lieutenant J. E. Saindbehurst, Coventry, has been elected an associate member of the Institution of Civil Engineers.

Lieut.-Colonel C. G. Bradley, D.S.O., who in civil life is borough engineer of Bridlington, has been elected an associate member of the Institution of Civil Engineers.

Mr. E. Binding, surveyor to the Highbridge Urban District Council, has been granted a commission as technical instructing officer for road and bridge construction in France.

Captain John Fred Hawkins, county surveyor of Berkshire, who was on the staff of General Gibbon at Gallipoli, has been mentioned in despatches for valuable services rendered during the war.

Mr. E. M. Bate, surveyor to the Frinton Urban District Council, has accepted a commission as Technical Officer to Regimental Labour Units, and is attached for duty to the Royal Surrey Regiment.

Mr. H. R. Hepworth, deputy county surveyor of the West Riding, Yorks, has had his salary increased from £350 to £370 a year, and Mr. H. M. Teasdale, first assistant, has had his salary advanced from £320 to £330.

Mr. A. L. C. Fell, general manager of the London County Council tramways, his numerous friends will be gratified to learn, is able to return to duty after a six months' leave of absence granted him on account of serious ill-health.

Mr. Harry Riding, surveyor, inspector, and gas and waterworks manager to the Batley-in-Wharfedale Urban District Council, has resigned in order to take up the position of waterworks engineer under the Wharfedale Rural District Council.

Mr. H. Herriott, chief sanitary inspector of Hove, has been voted an increased salary of £20 a year for extra services. To the assistan inspector a war bonus of 10 per cent on the first £50 of salary and 5 per cent on the remainder has been granted.

Mr. W. H. Eley, surveyor to the Newmarket Urban District Council, has joined a Works Battalion of the Devon Regiment, to which he has been appointed as technical officer with the rank of Second Lieutenant. During his absence Mr. A. S. Manning will act as temporary surveyor.

Mr. Henry F. Mence, surveyor to the St. Albans Rural District Council, has received instructions, through the Director-General of Military Railways and Roads, to raise, if possible, a company of 250 skilled roadmen, including steam-roller drivers, carpenters, wheelwrights, fitters, bricklayers, and blacksmiths, who will be attached to the Royal Engineers for special road work in France.

Mr. F. J. L. Robertson, the well-known secretary of Claridge's Patent Asphalte Company, Limited, has joined the R.N.V.R. The whole of the company's present staff has now joined the Forces, and the directors are to be congratulated on their efforts to "carry on" under such difficulties. We wish Mr. Robertson every luck, and the company continued prosperity.

Mr. Robert M'Millan, assistant surveyor for the burgh of Clydebank, met with a serious accident last Friday. While cycling behind a car he swerved to the right in order to pass the car and collided with another tramcar coming in the opposite direction. He was thrown on to the front platform and sustained a fracture of the skull. He was conveyed to hospital in an unconscious condition.

Mr. W. W. Gladdish's appointment as county surveyor of Norfolk is recommended for confirmation by the Eastern Highways Committee. The Western Highways Committee have already passed a similar recommendation. The chairman of the Eastern Highways Committee, Mr. R. E. J. Colman, in submitting the proposition, said they had nothing but praise for the way Mr. Gladdish had conducted himself and performed his duties.

Mr. Frank Fowler has obtained a commission in the Road Battalion, and will leave shortly for France. After serving his articles with the late Mr. W. H. Leete, county surveyor of Bedfordshire, Mr. Fowler became an assistant under the surveyor to the Sutton, Surrey, Urban District Council, and for about fifteen years past he has filled the position of assistant surveyor to the Staines Rural District Council. His experience of roadmaking is both extensive and varied, and he should prove a valuable officer.

Mr. Trevor Watts Phillips has passed the associate membership examination of the Institution of Civil Engineers, although two years below the usual age for admission to membership. Mr. Phillips served his articles with Mr. George Ball, borough engineer of Bexhill, and soon after the outbreak of war took up engineering in an important firm in the South of England. While at Bexhill he was a frequent contributor to our "Students'" column, and upon more than one occasion was awarded premiums. He is the son of Mr. T. Brice Phillips, A.R.SAN.I., of the Uckfield Rural District Council, papers by whom on rural housing and other subjects have appeared from time to time in our pages, and who was one of the founders of, and for some years hon. secretary to, the Sussex Public Health Officers' Association.

A month ago Blyth Urban District Council decided by a majority of 11 votes to 10 to appoint Mr. John Fawcett as surveyor to the district in succession to Mr. Robt. Grieves, resigned, but at the last meeting the chairman moved that the previous resolution be rescinded and that the position be advertised at a commencing salary of £300. A warm discussion took place on the subject. By the opposition (says the *North Star*) it was pointed out that prior to the amalgamation of the Blyth and Cowpen districts Mr. Fawcett acted as surveyor to the former authority, but as he was the junior of the two surveyors at the time Mr. Grieves was appointed, since which time Mr. Fawcett had acted as sanitary inspector. On a vote being taken the motion to rescind the previous resolution was carried by 11 votes to 9.

KILLED IN ACTION.

Lieutenant Hugh Thomas, Royal Field Artillery, who was an architect and surveyor under the Glamorgan County Council at Cardiff, has been killed in action in France.

Lance-Corporal A. F. Osborne, whose name appeared in a recent list of posthumous honours as the recipient of the Military Medal, was a general labourer in the Camberwell borough engineer's department.

OBITUARY.

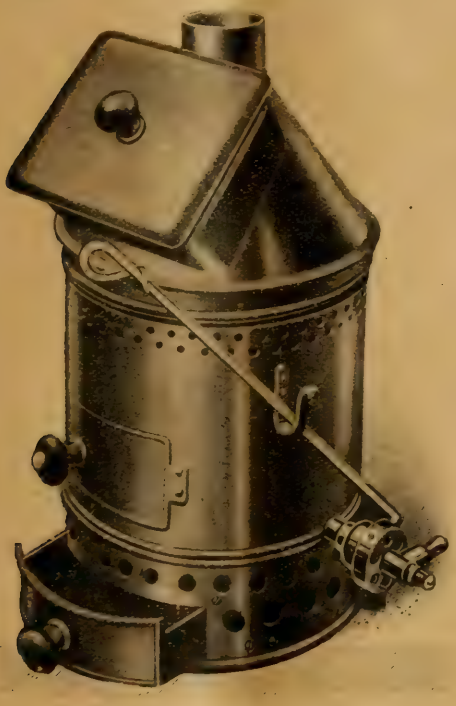
Mr. A. Shaw Butterworth, M.INST.C.E., city engineer of Port Elizabeth, South Africa, died suddenly there on the 5th inst., we regret to learn. Mr. Butterworth was previously borough engineer of Hythe, and he was appointed to the Port Elizabeth position in 1902. He was educated at the Leys School, Cambridge. Since he went to Port Elizabeth the corporation has embarked on a scheme for additional water supply, the installation of electric light, and a drainage scheme at the cost of nearly a million of money, each being formulated by Mr. Butterworth. Last year he visited England to complete contracts for the drainage scheme at a cost of £400,000, and the work was about to be commenced when his death took place.

Mr. Alfred Edward White, M.INST.C.E., who retired in October, 1914, after twenty-eight years' service as city engineer of Hull, died, we regret to state, on Friday last, at Bournemouth, after a long illness. Under his direction the Victoria Pier on the Humber was re-constructed, and he carried out other important engineering works, including the Drysdale Bridge, a swing bridge crossing the River Hull, with two movable spans and a fixed span; the Scott-street Bridge, a bascule bridge crossing the Hull, with a movable span of 51 ft. and two fixed spans; and the Stoneferry Bridge, a swing bridge crossing the river Hull, with an opening span of 60 ft. He was engaged in the construction of the sewage-pumping station for the east district of the city; a crematorium—the first municipal crematorium to be established in England; a park, cemetery, refuse destructor, and buildings for the electric-lighting station. He was also engineer with Mr. A. S. Barnard in equipping the tramways for electric traction. His public architectural work remains in the Cattle Market, the East Hull Baths, the City Hospital, and the Eva Fraser Hospital.

THE DISPOSAL OF HOUSE AND GARDEN REFUSE.

A DOMESTIC "BURN-ALL."

The Davis Domestic "Burn-all" illustrated herewith is, shortly stated, a compactly-arranged gas-fired apparatus for the rapid economical and hygienic disposal of every kind of house and garden refuse, wet or dry. The body of the apparatus consists of a steel-plate outer casting, with a removable inner lining of the same material. The fittings include: (1) An interior perforated combustion plate, on which rests the garbage to be burned; (2) a powerful atmospheric ring burner with the jets disposed to give judiciously varied flame lengths; (3) a gas injector and air regulator, with provision for either right or left



The Davis Domestic "Burn-All."

hand connection, by means of the usual gas barrel or flexible tubing; (4) a hinged door for inspection and raking; and (5) a poker for raking and loosening the garbage occasionally while burning. The base accommodates a projecting and removable tray, into which falls the ash of the garbage consumed, and around it are provided the necessary air ports for supporting combustion and ventilating the apparatus. The top cover, made as a removable lid affording ready access to the interior—carries the feeding aperture, with its separate and close-fitting cover, and the flue outlet, to which may be attached any necessary length of flue pipe.

The apparatus has been expressly designed to permit of it being placed on the top of any ordinary kitchen range, and it is as easy to fix as it is simple in operation.

Institution of Civil Engineers.—At a meeting of the institution to be held on Tuesday next, a paper, entitled "The New Electric Power-house at Birchills, Walsall," will be submitted for discussion by Mr. E. M. Lacey, M.Inst.C.E. The chair will be taken at 5.30 p.m.

Plan of Greater London. Speaking on Tuesday at a meeting of the London Society, Lord Plymouth said that during the war very useful work had been done in connection with the plan for the development of Greater London. The plan would not be published till after the war, when no time would be wasted in taking up the work. Sir Aston Webb said Mr. Walter Long (the late President of the Local Government Board) had favourably considered the plan, and had undertaken that no buildings should be erected which would interfere with the arterial roads which it provided for.

ROAD CONSTRUCTION IN MASSACHUSETTS*

By W. R. Farrington,
Division Engineer, Massachusetts Highway Commission.

Various bituminous materials are being used extensively on the heavier travelled roads outside the cities of Massachusetts. The usual form of construction is a base of broken stone 3 in. to 5 in. thick, with a top or wearing course 2 in. to 3 in. thick, consisting of broken stone mixed with the bituminous material. Formerly it was customary only to use stone up to 1½-in. or 1¼-in. size in the wearing course, but at present the small stone is put in the lower course to get rid of it.

Sand and oil roads were first constructed in Massachusetts in 1905. As constructed with the sand usually available and without the addition of other aggregate they will not carry much heavy traffic, especially if the proportion of horse-drawn vehicles is large. Experiments are being made with cement and stone dust additions, and the results indicate that some combination may be found which will result in a surface that will carry heavy travel economically.

SAND-OIL SURFACING.

The usual outfit for sand-oil surfacing consists of a mixer similar to a concrete mixer with charging device, and in most cases equipped with a heating attachment and a mechanical drier. These driers are similar to the conventional drying drums, but the flame is thrown either directly into the end of the drum or into a combustion chamber at one end. The asphalt or oil asphalt is heated in kettles before mixing, and where the ordinary hot attachment is used the oil is poured into the mixer through the flame. The mixture is spread usually in one course, shaped with rakes and immediately compacted, first with a horse roller and then with a tandem steam roller. If necessary, the surface is reshaped with a road machine before the final rolling.

The best results have been obtained with oil asphalts having a penetration of from 90 to 125; but if the grains of sand are rounded or if the size of the grains varies little, as with ordinary beach sand, a very heavy oil asphalt is best. The most satisfactory results have been obtained by the use of about 16 gallons per cubic yard of loose sand. The depth of cushion should be not less than 4 in. in the centre and 3½ in. to 4 in. at the sides. A seal coat should always be applied, using about half a gallon of fairly heavy hot oil per square yard, with sufficient sand to take up the oil.

In constructing a road by the sand-and-oil layer method, the subgrade is shaped and the sandy places hardened. One and one-half gallons per square yard of a fairly heavy hot oil is put on in two applications, or two gallons in three applications. Sand is spread after each application, and the surface compacted with a horse roller. If only 1½ gal. are used, it will probably be necessary to apply about half a gallon the following season.

The methods followed in constructing bituminous-gravel surfaces are similar to those described for sand and oil mixtures, except that a larger proportion of bituminous material is used. With these surfaces a base of gravel or broken stone is used, and the mixed wearing course is from 2 in. to 3 in. thick after rolling.

PENETRATION WORK.

The Massachusetts commission has, to a large extent, substituted the penetration for the mixing method on account of its lower cost, though there are certain advantages in the latter. The so-called double-penetration method has also been used to some extent. Under this method the wearing course is formed by successive layers of stone, with an application of bituminous material between each course and with a seal coat. Another method of penetration has been to mix sand with the bituminous material before it is applied. This method gives good results, but the surface is usually not quite as even as ordinary penetration work, and the first cost is greater. The results so far indicate that the surface will last longer, that resealing is not necessary so often, and that the cost of maintenance will be less. This method is not practicable except where proper sand is available.

The Massachusetts commission has determined generally, the heavy for the lighter grades of oils and tars for surface treatment. It is the general practice to use for the first treatment about half a gallon of

* Abstract of paper submitted at the Annual Convention of the American Road Builders Association.

oil with a viscosity of between 40 and 50 sec. at 100 deg. Cent. (Lawrence viscosimeter). The second season about ¾ gal. of oil with a viscosity of about 100 sec. should be applied, and the third season from ½ to ¾ gal. of a similar oil. After the second or third year, ½ gal. of oil with a viscosity up to 200 sec. can be used to good advantage. A combination of light and heavy oils has also been tried, the method being to form, with light oil, a thin coating thoroughly bonded to the road metal and then to apply about ½ gallon of hot oil with a viscosity of about 600 sec.

The methods of applying and maintaining tar blankets are similar to those for oil, but tar does not take up as much sand, and hence does not form so thick a blanket. While tar does not tend to bunch as readily as oil, it requires more frequent and heavier treatments.

IRELAND AND THE SUMMER TIME ACT.

OPPOSITION OF LOCAL AUTHORITIES.

In the House of Commons on Monday, Mr. Dillon asked the Chief Secretary for Ireland whether his attention had been called to the fact that in the West of Ireland, owing to the Act imposing Greenwich time upon Ireland, the Summer Time Act this year would put the clock an hour and forty minutes ahead of the sun, and whether in view of that fact it would not be desirable at least to repeal the Act imposing Greenwich time upon Ireland.

Mr. Duke reminded the hon. gentleman that he had already stated that the question would receive consideration.

Mr. O'Shaughnessy asked whether the right hon. gentleman was aware that most of the rural district councils in Ireland were against the Act, and the county councils as well had expressed their views on the matter.

Mr. Duke said he thought it was true that a majority of the rural district councils were opposed to a renewal of the Act and a majority of the urban district councils were in favour of it.

Mr. Delvin inquired whether the Act would apply to that part of Ireland that wanted it and would not be forced upon that part of Ireland that did not want it.

No answer was given to the question.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

EASTERN DISTRICT.

A meeting of the Eastern District of the Institution of Municipal and County Engineers will be held at Hoston and Isleworth on Saturday, the 31st inst.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ASSISTANT WATER ENGINEER.—March 19th.—Northwich Urban District Council. £180 a year.—Mr. J. A. Cowper, clerk, Council House, Northwich.

CLERK IN SURVEYOR'S OFFICE.—March 19th.—Skipton Rural District Council.—Mr. E. E. Godson, clerk, Skipton.

SURVEYOR AND INSPECTOR.—March 23rd.—Barnsley-Wharncliffe Urban District Council. £140 a year.—Mr. R. Stanley Mandale, clerk, Council Offices, Barnsley-Wharncliffe, Yorks.

MUNICIPAL ENGINEER.—May 1st.—Municipality of Lahore, India. £1,000—£1,600 per annum.—Mr. H. P. Tollinton, deputy commissioner and president Municipal Committee, Lahore.

DRAUGHTSMAN.—Port of London Authority.—Civil Engineer, Port of London Authority, 109 Leadenhall-street, E.C.

ROLLER DRIVER.—Southwell Rural District Council.—Mr. J. Ellis, clerk, Westgate, Southwell.

STEAM ROLLER DRIVER.—Wandsworth Borough Council.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

ROTHWELL.—March 19th.—For the various trades in erection of lavatories at the council offices, for the urban district council. Mr. J. Southwart, surveyor, Rothwell, near Leeds.

PEMBROKE.—March 29th.—For alterations and additions to a school-house, for the County Education Authority. Clerk of Works, County Education Offices, Haverfordwest, Pembrokeshire.

CORK.—April 2nd.—For the erection of a school.—Ballingeary R.I.C. Barrack, and the District Office of Works, Cork.

DEWSBURY.—April 2nd.—For the construction of water-closets or outbuildings, for the corporation.—The Borough Surveyor, Town Hall.

Engineering: Iron and Steel.

RHONDDA.—March 21st.—For the supply of house service meters, for the Electricity Committee.—Mr. J. M. Bowman, electrical engineer, Electricity Works, Porth, Glam.

SALFORD.—March 22nd.—For supplying and fixing heating boiler, for the corporation.—The Borough Engineer, Town Hall, Salford.

WIGAN.—March 31st.—The Education Committee offer for sale a second-hand corrugated iron and timber school, in excellent condition.—Mr. A. T. Gooseman, borough engineer and surveyor, King-street, Wigan.

Roads.

ST. HELENS.—March 17th.—For the supply of macadam, granite chippings, limestone chippings, granite setts, kerbs, channels, grit setts, concrete flags, sand and tarred macadam, for the corporation.—Borough Engineer, Town Hall, St. Helens.

HORSHAM.—March 17th.—For the supply of flints, granite, granite chippings and sand, for the rural district council.—Mr. W. Dengate, surveyor, 58 Park-street, Horsham.

KIVETON PARK.—March 17th.—For the supply of broken slag, granite, and tar macadam, for the rural district council.—Mr. F. Hewitt, surveyor, council offices, Kiveton Park Station, near Sheffield.

EPSOM.—March 19th.—For the supply of granite chippings, dug flints, fine gravel, sand, stoneware pipes, and team labour, for the rural district council.—Mr. T. E. Ware, surveyor, Waterloo-road, Epsom.

WANGFORD.—March 19th.—For the supply of granite, red broken gravel, and best fine marl, for the rural district council.—Mr. S. W. Rix, clerk.

HAYES.—March 19th.—For the supply of 10,000 gallons (more or less) of refined coal-tar, and for tar-painting 40,000 sq. yds. of highways, for the urban district council.—Mr. D. C. Fidler, surveyor, Council Offices, Hayes End, Middlesex.

BRAINTREE.—March 19th.—For the supply of broken granite, best quality slag, and broken flint, for the rural district council.—Mr. C. Vernon Bright, surveyor, London-road, Braintree, Essex.

BELFAST.—March 19th.—For the supply of setts, for the corporation.—Superintendent of Works, City Hall, Belfast.

CULMSTOCK.—March 20th.—For steam rolling the roads and manual labour, for the rural district council.—The District Surveyor, Culmstock, Devon.

STROUD.—March 20th.—For the supply of granite, basalt, limestone and tarred macadam, for the urban district council.—Mr. E. N. Witchell, clerk, 1 Lansdown, Stroud.

THORNE.—March 20th.—For the supply of dross screenings, granite, tar-macadam, and tar, for the rural district council.—Mr. H. Greenwood, clerk, 32 South-parade, Thorne, near Doncaster.

HUNTS.—March 21st.—For the supply of broken granite and slag, for the county council.—Mr. H. Leete, county surveyor, Market-place, Huntingdon.

ELY.—March 21st.—For the supply of 2,930 tons of granite and 1,050 tons of gravel, for the rural district council.—Mr. F. W. Firby, district surveyor, Sutton, Isle of Ely.

CHAILEY.—March 22nd.—For the supply of about 2,980 yds. of flints, 2,550 yds. of granite or other stone, and 60 yds. of gravel, for the rural district council.—Mr. C. Patrick, clerk, Union Offices, West-street, Lewes.

LONGBENTON.—March 22nd.—For the supply of hand-broken whinstone, for the urban district council. —Mr. W. Bean, highway surveyor, Council Offices, Forest Hill.

EASTRY.—March 23rd.—For the supply of surface and approved dug flints, and steam rolling, for the rural district council.—Mr. F. S. Cloke, clerk, Salisbury House, Strand-street, Sandwich.

DORKING.—March 24th.—For the supply of broken granite, tarred slag, and hire of steam roller, for the urban district council.—Mr. S. S. Gettings, surveyor, Council Offices.

NORMANTON.—March 24th.—For the supply of stone and concrete flags, kerbs, channels, setts, granite, limestone, slag, whinstone, slag chippings and grit, for the urban district council.—The Surveyor, Council Offices, Normanton.

REPTON.—March 24th.—For the supply of broken granite, limestone, slag, broken boulders, and local gravel, for the rural district council.—Mr. T. R. Sidgwick, surveyor, Willington, Derby.

RICCALL.—March 24th.—For the supply of road materials, for the rural district council. — Mr. J. Townend, clerk, Council Offices, 1 Abbey-place, Selby.

BLYTH.—March 24th.—For the supply of the best broken slag, for the rural district council.—Mr. F. Hopkinson, surveyor, 81 Bridge-street, Worksop.

BOGNOR.—March 24th.—For the supply of about 7,000 gallons of prepared road tar, for the urban district council.—Mr. J. Jubb, clerk, Council Offices, Bognor.

PONTARDAWE.—March 24th.—For the supply of road metal and haulage, for the rural district council. —Mr. W. Lewis, clerk.

HAMPTON WICK.—March 24th.—For the supply of granite chippings, shingle, and distilled tar, for the urban district council.—The Acting Surveyor, Council Offices, Hampton Wick.

WREXHAM.—March 26th.—For the supply of roadstone, for the rural district council.—Mr. G. V. Price, interim clerk, Council Offices, Midland Chambers, High-street, Wrexham.

COCKERMOUTH.—March 26th.—For the repair of highways, for the rural district council.—Mr. J. B. Wilson, Grecian Villa, Cockermouth.

DOCKING.—March 26th.—For the supply of materials and team labour, for the rural district council. —Mr. W. W. Hopking, Great Bircham, Docking, Norfolk.

WEST ASHFORD.—March 27th.—For the supply of 1,100 tons of granite, for the rural district council. —Mr. Alfred Sims, surveyor, 3 Queen-street, Ashford, Kent.

SHARDLOW.—March 28th.—For the supply of slag-macadam, Leicestershire granite, ironstone slag, limestone, kerbing, paving setts, and sanitary pipes, for the rural district council.—Mr. J. S. Wooddisse, surveyor, Aston-on-Trent, Derby.

RUGBY.—March 28th.—For the supply of about 100 tons of refined tar, for the urban district council. —Mr. J. H. Sharp, surveyor, Benn Buildings, Rugby.

CANNOCK.—March 30th.—For the supply of granite, furnace slag, tarred furnace slag, kerbs, setts, stoneware pipes and gullies, for the urban district council.—Mr. R. Blanchard, engineer and surveyor, Council Offices, Cannock.

WORTLEY.—March 31st.—For the supply of road material and carting, for the rural district council.— Mr. F. A. S. Crawshaw, surveyor, 17 Haymarket Chambers, Sheffield.

STOKE NEWINGTON.—The borough council have for sale four second-hand box distributor water vans of 450 gallons capacity.—Acting Borough Surveyor, Town Hall, Stoke Newington, London, N.

ABINGDON.—For the supply of about 4,000 tons of roadstone, and for haulage, for the rural district council. — Messrs. B. & E. M. Challenor, clerks, Council Offices, Stert-street, Abingdon.

Sanitary.

SLEAFORD.—March 17th.—For supplying and laying 300 lin. yds. of 9-in. sewer, for the rural district council.—Mr. W. B. Marsden, engineer, Northgate, Sleaford.

STEYNING WEST.—March 19th.—For the removal of house refuse, for the rural district council.—Mr. A. Flowers, clerk, Union Offices, Shoreham.

CAERPHILLY. — March 20th.—For scavenging various districts, for the urban district council.— Mr. T. H. Richards, surveyor.

FAREHAM.—March 20th.—For the collection and removal of house refuse, for the urban district council. —Mr. W. Butler, surveyor, Quay-street, Fareham.

PLYMOUTH.—March 21st.—For the reconstruction of a drain, for the corporation.—Mr. J. Paton, borough engineer, Municipal Offices, Plymouth.

BLACKBURN.—March 23rd.—For cleansing earth-closets and cesspools, for the rural district council.— Mr. J. Birch, clerk, 4 King-street, Blackburn.

GLASGOW.—March 26th. — For scavenging the Cathcart district.—Mr. W. Christie Cowan, clerk, 156 St. Vincent-street, Glasgow.

LUNESDALE.—March 30th.—For scavenging of Caton, for the rural district council.—Mr. A. H. Strachan, clerk, Council Offices, Hornby, Lancaster.

WALSALL.—March 30th.—For scavenging certain districts, for the rural district council.—Mr. A. H. Lewis, clerk, 29 Leicester-street, Walsall.

Stores.

SUTTON COLDFIELD.—March 19th.—For the supply of granite macadam, limestone, gravel and broken pebble stones, Yorkshire kerb, Rowley setts, earthenware pipes, cement and lime, iron castings, iron and steel, timber, hardware, oils and paints, and bass brooms, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor, Council House, Sutton Coldfield.

COVENTRY.—March 19th.—For the supply of broken roadstone, broken slag, granite kerbs, granite setts, stoneware pipes, castings and workmen's tools, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor, Council House, Coventry.

TOTTENHAM.—March 20th.—For the supply of road materials, lime, cement, forage, and brooms, for the urban district council.—Mr. R. C. Graves, clerk, Town Hall, Tottenham.

HORBURY.—March 23rd.—For the supply of flags, kerbs, setts, macadam, stone, chippings, tar-macadam, lime, engine oil and coal, for the urban district council.—Mr. W. Sugars, engineer and surveyor, Town Hall, Horbury.

NORTHWICH.—March 26th.—For the supply of earthenware pipes, cement, macadam, setts, coal, kerbstones, flags, paviors' work, and team work, for the urban district council.—Mr. J. A. Cowley, clerk, Council Offices, Northwich.

MOUNTAIN ASH.—March 27th.—For the supply of stoneware pipes, sand, cement, broken mountain limestone, and haulage, for the urban district council.— Mr. W. G. Thomas, surveyor, Town Hall, Mountain Ash, Wales.

Miscellaneous.

MANCHESTER.—March 19th.—For the supply and erection of chestnut wood fencing and gates, for the Small Holdings and Allotments Committee. — City Surveyor, Town Hall, Manchester.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BEDWAS AND MACHEN.—For the supply of ballast, metalling, and lamp oil, for the urban district council:—

Bedwas Colliery Company, Bedwas.—Metalling, 4s. 6d per ton; ballast, 1s. 3d. per ton.
Machen Stone Company, Machen. Chippings, 8s. 3d. per ton; gravel, 8s. 3d. per ton.

CAISTOR. Accepted for the supply of about 20,000 gallons of refined or distilled tar, for the rural district council Mr. J. Surfleet, surveyor:—

Contract and Works Supply Company, Grimsby, 3d. per gallon.
Caistor Gas and Coke Company, Limited, Caistor (at different stations), 2½d. per gallon.

HORNCASTLE.—Accepted for the supply of 260 tons of X granite, 300 tons of XX granite, 150 tons of X slag, and 70 tons of slag or granite chips, for the urban district council.—The acting surveyor:—

Groby Granite Company, Limited, Groby ..	£426
Cliffe Hill Granite Company, Limited, Markfield ..	44
C. L. Stiff & Co., Limited, Irlam	68

[illegible] Tenders for the supply of materials, for the ensuing year, to the Rural Sanitary Authority [illegible] borough surveyor:—

[illegible] Hodgson & Co., Limited, Brighton, £2 18s. 8d. per load.

[illegible] Pearce & Co., Limited, London, S.E.:—Prices.

[illegible] Patent Victoria Stone Company, Limited, London, E.C.:—Prices.

[illegible] Patent Victoria Stone Company, Limited, London, E.C.:—3s. per yard super.

[illegible] Wright, Dove horse and driver, not exceeding [illegible] per day; horse and driver, exceeding [illegible] cwts., per day, 6d.

HULTON LEES.—For the supply of broken granite, 1 by [illegible] granite, limestone and slag [illegible] stone, stoneware pipes and gullies, and [illegible] the urban district council:—

[illegible] Limited, Manchester and Halifax.—Granite setts, [illegible] dry macadam.

[illegible] Limited, Clitheroe.—Chippings.

[illegible] Limited, Darwen.—Coated slag and slag dust.

[illegible] & Co., Farnworth, R.S.O.—Pitch and oil, and [illegible].

Lancashire Road Fencing Company, Altrincham Road [illegible].

Manchester Bitted Axle Society, Manchester.—Brooms, &c.

[illegible] Limited, Hartwell.—Cement.

[illegible] & Co., Limited, Berwick, Lancs.—Pipes.

[illegible] Wales Lighting [illegible].

[illegible] Limited, Little Hulton.—Hardware.

J. W. Thompson, Little Hulton.—Izal liquid and powder.

[illegible] & W. Sherratt, Manchester.—Sanitary powder.

Jeyes Sanitary Compounds, Limited, London, E.C.—Sanitary soap.

GLENGOW.—For the supply of metal, borders, setts, and [illegible] for the Urban District Committee. Mr. R. Drummond, road surveyor:—

[illegible] Parker	£1,980
[illegible] & Co., Limited, Glasgow	1,970
[illegible] Limited	1,806
[illegible] Limited	1,490
[illegible] Company, Troon	1,260
[illegible] & Sons, Hawkhead	1,130
[illegible] Natural Moss	1,080
[illegible]	740
[illegible]	600

RICHMOND, Yorks.—For the provision of an additional exit and lavatory accommodation at the town hall, for the [illegible]. Mr. H. W. Marsden, borough surveyor:—

[illegible] & Sons, Darlington	£150
W. Harrison, Richmond	120
[illegible], Richmond	104

SUNBURY-ON-THAMES.—For the supply of 500 tons of Guernsey, Clee Hill, Bardon Hill, or Charnwood granite, and [illegible] tons of [illegible] macadam, for the urban district council:—Mr. H. F. Coales, surveyor:—

GRANITE.

	Per ton. s. d.
J. Mowlem & Co., Westminster, S.W.	25 0
[illegible] Macadams, Limited, Cannon-street, E.C.	22 5
[illegible], Limited, Westminster, S.W.	20 4
[illegible] & Marriage, Limited, Clee Hill	17 11
Clee Hill Dhu Stone Company, Ludlow	17 11
[illegible] Granite Quarries Company, Limited, [illegible]	17 11

TAR-MACADAM.

	s. d.	s. d.
J. Oakes & Co., Alfreton	19 6	
Constable, Hart & Co., Eastcheap, E.C.	19 0	-20 0
[illegible] & Son, Walsall	19 0	19 6
[illegible], Limited, Wolverhampton	18 9	19 3

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

[illegible] of Civil Engineers.—Mr. E. M. Lacey on "The New Electric Power-house at Birchills, Walsall." 5.30 p.m.

[illegible] Town Planning Institute.—Mr. W. Rees Jeffreys on "Road Construction and Improvements by Means of Town Planning Schemes." 6 p.m.

[illegible] Institution of Municipal and County Engineers.—North-Eastern District Meeting at Spennborough.

[illegible] of Municipal and County Engineers.—[illegible] District Meeting at Heston and Isleworth.

APRIL.

[illegible] Institution of Municipal and County Engineers.—Eastern Section District.—Suffolk, Norfolk, and Cambridge Meeting at Beccles.

APPOINTMENTS OPEN.

THE ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON TUESDAY ARE INSERTED IN THE FOLLOWING DAY'S ISSUE.

CLERK [illegible]—Sleaford Rural [illegible]. [illegible]

SURVEYOR AND [illegible]—Urban District Council. Applications, stating [illegible] Wharfedale, [illegible], should reach THE SURVEYOR *office by noon on Thursday, the 22nd inst., for inclusion in the weekly list of a few [illegible] Mr. R. Stanley Maxdale, Clerk to the Council, Council Offices, Burley-in-Wharfedale, may, in cases of emergency only, be sent direct to him.* (3,358) *subject to later con-*

MUNICIPAL ENGINEER [illegible]—City of Lahore, India. £1,000 *N.* Mr. H. P. Tollerton, deputy assistant [illegible]. Must be [illegible], Municipal Committee, Lahore. Applications, stating [illegible]

DRAUGHTSMAN.—Port of London Authority required, and accompanied by three recent testi[illegible] Chief Engineer, Port of London Authority, [illegible], E.C. 14th March, to [illegible]

ROLLER DRIVER [illegible]—Southwark [illegible] NKINS, Council. Mr. J. Ellis, Clerk W[illegible] Borough Engineer.

STEAM ROLLER DRIVER [illegible]—Council. Mr. P. Dodd, Council [illegible] Highroad, S.W. (3,345)

BOROUGH OF WANDSWORTH.

Wanted, a Driver, for Mann Light Steam Roller. Must be above military age or ineligible for the Army.

Applications, with copies of not less than two testimonials, to be sent to the undersigned.

P. DODD,
Borough Engineer.

Borough Engineer's Office,
215, Balham High-road, S.W.
March 9, 1917. (3,357)

URBAN DISTRICT COUNCIL OF BURLEY-IN-WHARFEDALE.

APPOINTMENT OF SURVEYOR, INSPECTOR OF NUISANCES, GAS AND WATER MANAGER.

The above Council invite applications from persons ineligible for military service for the above united Offices.

The population of the district is 3,762, and the area 3,133 acres.

The salary as Inspector of Nuisances is £40, and for the other combined offices £100, making a total of £140 per annum.

Candidates must have a thorough and practical knowledge of road maintenance, be able to prepare plans, quantities, specifications, and estimates of works, and be able to keep the prescribed accounts.

The duties as Inspector will include those prescribed by the Public Health Act, 1875, and the other Acts in relation thereto, the Housing, Town Planning, &c., Act, 1909, the various Orders of the Local Government Board, and such others as the Council or the Local Government Board may at any time direct.

The candidate should hold the Certificate of the Royal Sanitary Institute or other competent body recognised by the Local Government Board.

The appointment, so far as regards the office of Inspector of Nuisances, will be made subject to the sanction of the Local Government Board.

The person appointed will be required to reside in the district, and devote his whole time to the service of the Council.

Applications, marked "Surveyor," in candidate's own handwriting, stating age, previous occupation, and experience, with copies of not more than three recent testimonials, to be sent to the undersigned not later than Friday, the 23rd inst.

Canvassing will be deemed a disqualification.

(By order)
R. STANLEY MAXDALE,
Clerk to the Council.

Council Offices,
Burley-in-Wharfedale,
March 12, 1917. (3,361)

MISCELLANEOUS.

FOR SALE—Four Secondhand Box Distributor Water Vans, 450 gallons capacity. May be seen on application at the Council's Depot, Lordship-grove, Lordship-road, Stoke Newington, N. Tenders to be addressed to Acting Borough Surveyor, Town Hall, Stoke Newington, N. (3,360)

TENDERS WANTED.

HORBURY URBAN DISTRICT COUNCIL.

The General Works Committee invite Tenders for the Supply and Delivery of the undermentioned Materials required during the year ending March 31st, 1918:—

Flags, Kerbs, Channels and Setts.
Macadam, Stone and Chippings.
Tar-macadam.
Lime.
Engine Oil.
Coal.

Specifications and Form of Tender may be obtained upon application to the undersigned.

Sealed Tenders to be delivered to me at the Town Hall, Horbury, not later than 10 o'clock a.m. on Friday, the 23rd inst.

The lowest or any Tender not necessarily accepted.

W. SUGARS,
Engineer and Surveyor.

Town Hall,
Horbury. (3,355)

The Surveyor

And Municipal and County Engineer.

Vol. LI. MARCH 23, 1917. No. 1,314.

Minutes of Proceedings.

The Porthcawl Esplanade Case.

There are several reported cases in which the courts have considered the effect of an agreement between a local authority and landowners with reference to the making up and adoption of a private street. In such cases, of course, the decision turns upon the wording of the particular agreement, and the interpretation put upon it by the court in the light of the circumstances in which it was entered into. The recent case of *Porthcawl Urban District Council* v. *Brogden* is of unusual interest in this connection. This was an action in which the district council claimed to be entitled to a charge on the Esplanade Hotel and a piece of building land (both belonging to the defendants) for the sum of £180 10s. 10d., being the amount charged in the final apportionment of the expenses of making up St. Mary's-street, Porthcawl, under the Private Street Works Act, 1892. The defendants claimed to be exempt from liability under the terms of a deed of conveyance dated in 1901, made between themselves and other landowners of the one part and the council of the other part, whereby a piece of land fronting the sea was conveyed to the council to be laid out and dedicated to public use as an esplanade, and it was expressly agreed by the council that the Esplanade Hotel and certain other specified buildings, and all other lands of the respective owners which were not then occupied with buildings, and which abutted on the esplanade, should be free and exempt from all charges in respect of the works which the council agreed to do on the esplanade, or any works under the Public Health Act, 1875, or the Private Street Works Act, 1892, or any other similar Act for the time being in force. Now the Esplanade Hotel fronts on the esplanade, but certain premises belonging to it, as well as the building land in question, abut on St. Mary's-street, which runs at right angles to the esplanade; and the council contended that the exemption was limited to works done on the esplanade itself, and did not apply to works on St. Mary's-street. Mr. Justice Sargant accepted this interpretation of the stipulation in the deed of conveyance, and gave judgment in favour of the council. "On the construction of the whole deed," said his lordship, "I hold that, although the words of the exemption are sufficiently wide in themselves to protect the defendants, they can be controlled by a sufficient context. The whole arrangement is obviously with regard to the frontage on the esplanade, and the works contemplated cannot be meant to apply to existing or future side roads, or existing or future roads at the back. Words must be implied such as 'as so abutting,' or 'in respect of such abuttal.'"

If we may say so, with the utmost respect, this decision seems to us to be sound common sense, and in accordance with the obvious intention of the parties to the deed. It is satisfactory that the case was thus disposed of on the merits. But another point was raised by the council which, though of a technical character, is an interesting and important one. They contended that, inasmuch as the defendants had not objected to either the provisional or the final apportionment, it was too late for them to dispute their liability in these proceedings. It will be remembered that the Act contains special provisions as to the hearing of objections to the provisional apportionment by a court of summary jurisdiction, and that, under sec. 8, sub-sec. (2), no objection which could be made under the Act is to be otherwise made or allowed "in any court, proceeding, or manner whatsoever." The defendants contended that this provision only applies to questions as to the correctness of the apportionment, and not to questions as to the liability of the persons charged. But, as Mr. Justice Sargant pointed out, an owner can, under sec. 7 head (*e*) of the Act, object on the ground that any premises ought to be excluded from the provisional apportionment, and under head (*f*) he can object on the ground that the apportionment is incorrect in respect of some matter of fact to be specified in the objection. A very similar question was decided in *Wallasey Urban District Council* v. *Walker & Co.* (70 J.P., 199) under a local Act containing provisions practically identical with those of the Act of 1892. In that case the defendants were charged in the provisional apportionment in respect of premises separated from the street by a strip of land belonging to other owners. They did not object to the apportionment, but resisted payment on proceedings being taken to recover the amount charged against them, and it was held that, the point being one which could have been raised by way of objection under the local Act, could not be allowed in the proceedings. Upon the authority of this decision Mr. Justice Sargant held, in the Porthcawl case, that the defendants were too late to raise an objection based upon the stipulation

contained in the deed. This, of course, would have been sufficient to ensure the success of the council, even had the decision on the merits been adverse to them.

* * *

Waste Utilisation.

"Waste not, want not" is an old proverb, and contains that sane mixture of profound truth and sound common sense which is to be found in all proverbial sayings. In the piping times of peace, when luxuries as well as necessaries were plentiful, the people of this country were unquestionably careless about the avoidance of waste, and scientific economy, based upon industry, frugality, and discretion, was practically unknown in daily life. Even in those days, however, the voice of the prophet was heard from time to time declaring how waste products, instead of being discarded or destroyed, could be turned to profitable use. And now, after two and a-half years of war expenditure, rigid economy in every direction has become a matter of vital necessity, and the country is ready and eager to learn the lesson of waste utilisation. Local authorities should therefore be in a position to take effective action on the suggestions recently made by the President of the Local Government Board as to the importance at the present time of utilising waste food, particularly fat and bones, and other organic waste, both of animal and vegetable origin, and also waste paper, cardboard, &c., wherever this is practicable. Lord Rhondda particularly requests that local authorities will ascertain whether all that can be advantageously done in the collection and use of waste food from hotels and restaurants is being done, and if not, that they will consider what measures can be adopted for using the waste as food for pigs, rabbits, or poultry. It is further proposed that in the case of private households a number of inhabitants may be induced to combine together for the utilisation of waste, which can be collected by or on behalf of those who can make profitable use of it. At some places special measures are taken for utilising the waste of slaughter-houses and condemned food, and Lord Rhondda asks local authorities generally to consider what can be done in this respect in their districts. He also emphasises the special value of bones and fat for the production of glycerine for munitions purposes.

As regards the collection of waste paper, we may perhaps be permitted to refer to an ingenious scheme that has been successfully launched in Twickenham. The actual house-to-house collection is effected by boys from the elementary schools, provided with special badges and canvas bags. The paper as collected is taken to the schools, whence it is collected in the council's carts and taken to a depot, where it is pressed into bales and sold. The boys are paid for their work partly in cash and partly in War Savings Certificates. The proceeds of the sale are devoted to repayment of money advanced by the council for the necessary equipment and to the payment of the boys. Here is a scheme which might with advantage be adopted in other districts. It provides the best method which has as yet been brought to our notice of getting over the difficulty of a separate house to house collection of waste paper by means of the ordinary dust collectors.

* * *

Standardisation.

The chairman of the Engineering Standards Committee, Sir John Wolfe Barry, K.C.B., F.R.S., has accepted the invitation of the council of the Institution of Civil Engineers to give the James Forrest lecture on Wednesday, May 2nd. As the initiator of the organised movement of standardisation in this country, the lecturer has very appropriately taken as his subject, "The Standardisation of Engineering Materials and its Influence on the Trade and Prosperity of the Country." The growth of the principle of standardisation has been due in great measure to the steady work of the Engineering Standards Committee during the past sixteen years, covering, as it does, most of the branches of engineering practice. The lecturer, we understand, intends to draw particular attention to the new and important step taken by the committee, which has for its object the furthering of British trade abroad through the wider dissemination in the British Dominions and in foreign countries of the British Standard Specifications translated into French, Spanish, and Russian. Mention will also be made of the local standards committees which are being formed in some twelve countries abroad, and, lastly, of the fact that, when the necessary arrangements can be completed, British Standard Specifications will be available to the public, both in their English and foreign editions, at a flat rate of 1s. each, or its equivalent in foreign moneys. In connection with this new development, we are informed that the appeal which the committee has lately issued to the engineering industry of the country has, so far, resulted in the receipt of contributions amounting to over £12,000 from the leading technical institutions, trade associations, and manufacturing firms, and that H.M. Treasury has quite recently intimated the intention to ask Parliament to grant the committee a sum of £10,000 for this special purpose. We feel sure that all will agree as to the benefits which are bound to accrue to British trade and to the country at large through the widening of the scope of the committee's activities now proposed, and we confidently expect that all those who are interested in the development of the export trade of the country will co-operate with the committee in every way, and thus ensure the complete success of this important movement.

* * *

Bognor Coal Dues.

Probably few of the thousands of visitors who flock to Bognor every year are aware that part of the local revenue of the town has been obtained from an antiquated system of coal dues. The council recently applied for a Provisional Order to enable them to abolish the dues, and this application was the subject of an inquiry last week, at which a statement of exceptional interest was made by Mr. Joseph Jubb, the clerk. It appears that the dues were originally constituted under an old local Act of 1822, and were granted to commissioners appointed to govern the town for the purposes of defraying the costs of obtaining the Act, of keeping roads and ways in proper repair, and for carrying out improvements. The dues amounted to 1s. per chaldron or ton, but after three years there seemed very little likelihood of paying off even the costs of obtaining the Act. Another Act was obtained in 1825, and a further Act in 1835. Under the last power was granted to increase the dues to a maximum of 2s. It must be obvious, apart from all other considerations, that the incidence of rating created by these archaic Acts of Parliament was opposed to modern ideas, and it was inequitable that the amount of coal a person consumed should be a criterion of what he contributed to the municipal exchequer. The effect of the system was that each householder paid an unequal amount compared with shopkeepers, who burned little or no coal. Other reasons which Mr. Jubb cited in favour of abolition of the dues were: (*a*) Difficulty in collecting dues; (*b*) the "drawbacks"—*i.e.*, coal brought into the district and afterwards consumed outside the district, and upon which, therefore, no dues were payable; (*c*) the anomaly of having two systems of ratings; (*d*) the fact that

the dues, being purely local, were not known to outsiders; (*e*) the fact that the council was muleted in income-tax on the amount of dues collected; (*f*) that abolition would result in the reduction of price of coal to its proper level; and (*g*) the trouble and expense to coal merchants of keeping accounts of dues and "drawbacks" and furnishing returns thereof to the council.

* * *

The Activated Sludge Process.

The further information given on another page by Mr. Edward Ardern, M.Sc., in a paper read before the Manchester section of the Society of Chemical Industry, should be of considerable value to those who contemplate the adoption of the activated-sludge process for the treatment of their sewage, particularly if it is of a purely domestic character. One of the most hopeful features of this method is its adaptability to the needs of each particular case. Where the sewage contains trade wastes, or is exceptionally strong, a large volume of air and long periods of aëration are necessary, but where the sewage is of a purely domestic character shorter periods of aëration and a smaller volume is sufficient to produce a stable effluent. But this is not all. In cases where the volume of diluting water is considerable, and of a fairly clean character, a further reduction in the volume of air required may be made and varied from time to time to suit the variations in the volume and character of the river water. In fact, the extent to which the purification of the sewage is carried can be adjusted to a nicety to meet the local conditions. These latest experiments also show that the low temperatures of winter in this country have no material effect upon the process of purification by this method, and that the activity of the sludge, so far as oxidation of the carbonaceous matter and clarification is concerned, can be maintained without reference to the degree of nitrification. All these results indicate that it will be possible before long to bring down the operating costs of this process to such figures that many places will find it well worth while to consider its application to existing works, especially in those cases where considerable alterations and additions are inevitable in order to enable them to cope with an increase in the volume of sewage. We hope that further information as to the cost of working will be available before long from the several larger installations which have been in operation for some time.

* * *

The Federation of British Industries.

The holding of the first general meeting of the Federation of British Industries is an event which cannot be allowed to pass unnoticed. The Federation, as its name implies, comprises organisations of manufacturers and trade associations of all kinds, in addition to a considerable number of individual firms, and in the difficult times which lie ahead it will have ample opportunities for useful service. One of the principal objects with which it has been formed is to command the attention of the Government when matters of industrial legislation are under consideration. In this connection it is already fully realised that the wider the membership the greater will be the influence that can be brought to bear. We may perhaps observe in this connection that the same principle applies to the organisation of local government officials. It is only by strong, united effort that effective action becomes possible. In the course of his address, Mr. F. Dudley Docker, the president, referred to such questions as the future relations between capital and labour, the suggested establishment of a trade bank, and the need for organised technical education. All these are matters of the first importance, but the last is probably of greatest immediate interest to our readers. Mr. Docker made a plea for greater attention to the practical side of technical education at our universities, and hinted at the advisability of a judicious combination between the purely university training and actual workshop practice. This is a plan which has been set forth in these columns on more than one occasion, and which has much to commend it. It is all to the good that the question is under active consideration by such a representative body as the Federation of British Industries.

* * *

The Ministry of Munitions and Dublin Rebuilding.

We gather from the *Irish Builder and Engineer* that a considerable number of designs for rebuilding the destroyed area of Dublin have been prepared, and in many cases lodged with the corporation. The city architect has drawn up a scheme in outline, fixing the principal heights and levels of main cornices and string cornices, and has, it is believed, succeeded in arranging for its observance in one of the proposed blocks of buildings. No definite decision as to material has been reached, but most of the designs are stated to be in red brick and stone. It is to be regretted that the rebuilding is being delayed by a want of materials, particularly in regard to steel, which, with timber and lead, cannot be obtained except by the permission of the Ministry of Munitions. During the discussion of the Reconstruction Bill in Parliament, Mr. Duke gave a promise that the Ministry of Munitions would place no obstacles in the way of the necessary materials being used in Dublin, but since then the Ministry of Munitions has written to Sir P. Shortall regretting "that no assistance can be given to obtain steel joists or lead," and suggesting that he should consider what materials could be substituted for steel or lead. This is not the first exhibition in recent experience of a lack of co-ordination between Government departments, but it is no less deplorable on that account. It is to be hoped that the good offices of some kindly conciliator will be able to remove this barrier to work of supreme importance to Dublin, and arguably of national importance.

* * *

Home Food Production.

There can be no question as to the desirability of every possible step being taken at the present time to encourage home food production, not only by means of the kitchen garden or allotment, but also by the keeping of pigs and poultry. Realising this, the Hull Corporation have adopted a scheme by which the first cost of erecting pigsties and fowl-houses on private property will, upon application, be borne by them, the tenants being under an obligation to make an annual repayment equivalent to 10 per cent of the amount expended. We gather, however, from the proceedings at a recent meeting of the Property Committee, that there is considerable difference of opinion as to the wisdom of this scheme. At the meeting to which we refer a discussion arose upon a letter from a tenant asking the corporation to construct a fowl-house in his garden and charge him with a percentage of the cost. The chairman took the view that, under the resolution of the city council, the committee had no option but to comply with the request. Several members, however, made it clear that they were opposed to this course, and in the result a motion in favour of the proposal was rejected by a substantial majority. It is perhaps a little difficult to express an opinion as to the merits of the scheme as adopted by the corporation, but, on the whole, it may perhaps be considered as being justified in the exceptional circumstances of the present time, although it might be hard to justify the application of public funds to such a purpose under more normal conditions.

The Activated Sludge Process of Sewage Purification.

By EDWARD ARDERN, M.Sc.

[The subjoined paper, which is reproduced from the issue of the "Journal of the Society of Chemical Industry" for January 31st last, by special permission of that body, was read at a meeting of the Manchester Section of the Society held on December 1st, Mr. J. H. Hoseason in the chair.]

The rise and development of this method of sewage purification has been described in a series of three papers, entitled "The Oxidation of Sewage without the Aid of Filters," presented to this section of the society during the past two years.

It was observed from the first that the purification process was subject to disturbance in the presence of certain trade-wastes of inhibitory character.

For the purpose of investigating the effect of such trade effluents on the activated sludge process, the experimental plant employed previously when working with the Manchester sewage received at the Main Outfall Works, Davyhulme (a strong trade sewage), was transferred in July, 1915, to the Withington Sewage Works, Cheadle-cum-Hardy, where a purely domestic sewage is dealt with.

The preliminary results obtained during the period the activated sludge was being "built up" were, however, so remarkable that it was decided to postpone the trade-effluent trials pending a careful survey of the possibilities of the activated sludge process as applied to the purification of a weak domestic sewage free from manufacturers' effluents.

This communication is concerned with a brief account of the results of the investigation, which has extended over a period of fifteen months.

The plant employed consisted of wooden casks of 200 litres capacity (net). The aëration was effected by diffusing the air through a porous tile placed on the bottom of the cask. The air supply was always sufficient to maintain complete admixture and circulation of the sludge and sewage. The floating matters and grit had been removed from the sewage dealt with by prior screening and adequate detritus tank treatment.

The method of "building up" the activated sludge was that described in the last paper† on the subject.

For a period of nine days from the commencement of operations the cask was filled once each day, an aëration of 21 hours being allowed. The remaining three hours was occupied by quiescent settlement of the accumulated suspended matters, discharge of effluent and refilling with sewage.

Subsequently the aëration period was reduced and the number of fillings rapidly increased without diminution in the purification effected, so that after the experiment had been in progress eighteen days four fillings per day were allowed with an average of four hours' aëration. After operating for a fortnight in this manner the average aëration period was reduced to 2 4-5 hours, and five fillings per day allowed for a period of eleven days. Eventually the cask received six fillings per day, with the following aëration periods: Three fillings one hour, and the other three fillings, two hours, three hours, and four hours respectively, or an average aëration period of 2 1-6 hour.

Working in the manner described above, 15 per cent. by volume consisted after two hours' settlement) of partially activated sludge—*i.e.*, 30 litres or 6·6 gallons, were obtained from 2,970 gallons of sewage dealt with during the first 31 days, which was increased to 31 per cent., or 62 litres or 13·6 gallons per day, during twelve days. At this point 5,180 gallons of sewage had been treated in the cask. On the basis the sludge production is equal to about 12 lbs. per million gallons of sewage treated.

The results obtained during this initial period were of such a character that it became of interest to determine whether they could be maintained indefinitely without regard to the establishment of active nitrifying organisms in the sludge.

At this stage, therefore, the partially activated sludge which had been accumulated was divided equally between two casks, one of which was operated with six fillings per day as previously, while the other was worked in such a manner as to allow a development of nitrifying organisms.

For this purpose, the first filling of sewage was aëtated continuously until the free and saline ammonia content of the sewage had disappeared and nitrification was complete, which required 48 hours' aëration. Subsequent fillings were likewise aërated until the sewage was completely nitrified, the aëration period required during the following nine days varying from eight to 23 hours, dependent on the strength of sewage treated. Later it was found easily possible to allow two fillings per day with an average aëration period of ten hours, and within fourteen days of commencing to establish nitrifying organisms three fillings were being given (six hours' aëration) with the production of highly nitrified effluents. Finally the quantity of sewage dealt with was increased by allowing four fillings per day with an average aëration period of four hours, at the same time maintaining a highly purified and well nitrified effluent.

It may be noted that nitrifying organisms were much more readily established in the sludge obtained from the Withington sewage than in that produced from the trade sewage at Davyhulme *e.g.*, the first filling of Davyhulme sewage usually requires fifteen days' aëration in contact with the partially activated sludge for complete nitrification. Further, there is no ammoniacal fermentation of the sludge meanwhile or production of turbid effluents, and the alkalinity of the sewage is always sufficient to allow nitrification to proceed to completion.

During this period of complete maturing of the activated sludge, the cask containing the partially activated sludge continued to receive six fillings per day, but the total aeration periods had been reduced from twelve hours to ten hours, divided as follows: Four fillings one hour aëration and two fillings three hours' aëration, when the sewage was at its maximum strength, or an average of 1⅔ hours' aëration per filling.

The average results obtained from the operation of the casks containing the two types of sludge over a prolonged period, embracing a great variation in temperature conditions, are given in the table on p. 299. The volume of sludge in each case varied from 20 to 25 per cent. and the volume of purified effluent discharged after each filling was equal to 75 per cent of the total capacity of the cask.

No. 1 cask contained partially activated sludge and No. 2 cask fully activated sludge.

In general, the effluents obtained from the two casks were equally well clarified, although in some cases, especially during prolonged dry weather, when a stronger sewage was dealt with, the effluent yielded by the partially activated sludge exhibited a faint turbidity, whereas those from the fully activated sludge were invariably perfectly clarified.

The above results show that except for a somewhat lower albuminoid ammonia content, which is reflected in a reduced dissolved oxygen absorption, the difference between the effluent yielded by the fully activated sludge and that obtained from the partially activated sludge is confined to the amount of nitrification.

Their importance lies in the fact that they demonstrate that the activity of the sludge, so far as oxidation of carbonaceous matter and clarification is concerned, can be maintained without reference to the degree of nitrification.

This result is contrary to the experience gained in the earlier experiments when working with the trade sewage at Davyhulme, and means that if nitrification is not required—and it is certainly not essential—high-class effluents, easily within the standard suggested by the Royal Commission on Sewage Disposal, can be produced from domestic sewage by the activated sludge process, with a considerably reduced aeration period at consequently lower cost.

In view of this material difference between results obtained at Withington and Davyhulme, obviously it was important to ascertain whether similar differences were to be found with regard to the question

† Ardern and Lowett: Journal of the Society of Chemical Industry, September 30, 1915, No. 18, Vol. xxxiv.

of the effect of temperature on the purification process.

Operations with the two types of sludge were therefore extended throughout the winter and summer months.

In the following tables are given the results obtained when working (in each case) with from 20 per cent to 25 per cent by volume of sludge (measured after two hours' settlement) and removal of effluent after each period to the extent of 75 per cent of the contents of the cask.

Results in Parts per 100,000.

	Screened sewage.	No. 1 effluent.	Screened sewage.	No. 2 effluent.
Four hours' oxygen absorption	3·34	0·70	3·40	0·64
Free and saline ammonia	2·61	1·66	2·64	0·35
Albuminoid ammonia	0·71	0·11	0·70	0·08
Nitrite and nitrate (as NH_3)	—	0·41	—	1·40
Dissolved oxygen absorption (Royal Commission test)	—	1.20	—	0·84
No. of fillings per day	—	6	—	4
Average aeration period	—	1¾ hours	—	4 hours
Volume of sewage dealt with per day	—	187 gallons	—	125 gallons

Results in Parts per 100,000.

	February and March, 1916. Temperature 5° to 10° C.			August and September, 1916. Temperature 16° to 19° C.		
	Sewage.	Effluent No. 1.	Effluent No. 2.	Sewage.	Effluent No. 1.	Effluent No. 2.
Four hours' oxygen absorption	3·30	0·74	0·63	3·76	0·69	0·64
Free and saline ammonia	1·00	1·53	0·44	2·77	0·60	0·20
Albuminoid ammonia	0·64	0·12	0·10	0·74	0·09	0·07
Nitrite and nitrate (as NH_3)	—	0·37	1·37	—	0·67	1·44
Dissolved oxygen absorption (Royal Commission test)	—	1·11	0·87	—	1·14	0·81
No. of fillings per day	—	6	4	—	6	4
Average aeration period	—	1¾ hours	4 hours	—	1¾ hours	4 hours
Volume of sewage dealt with per day	—	187 gallons	125 gallons.	—	187 gallons	125 gallons
Percentage purification calculated on:—						
Four hours' oxygen absorption test	—	78	81	—	82	83
Albuminoid ammonia test	—	81	84	—	88	91

There was no appreciable difference in appearance between the effluents obtained during the winter and summer months; in each case they were invariably well clarified and contained only very small quantities of suspended matter.

It will be seen that the purification was not materially retarded by the low temperature experienced during February and March.

In the case of the partially activated sludge, however, there was a considerably reduced nitrification effect.

In the light of these results it would appear that the detrimental effect of low temperatures (below 10 deg. Cent.) found when working with the Davyhulme sewage must be ascribed to the lowered vitality of the organisms present in the sludge, due to the constant presence of inhibitory trade waste, which renders them more susceptible to changes in temperature.

ACTIVATED SLUDGE.

In the following table is given an average analysis of the activated sludge obtained from the Withington sewage together with comparative figures for the sludge produced from the Manchester sewage at Davyhulme, and from the Salford sewage:—

Analysis of Activated Sludge (Dry).

	Withington	Manchester.*	Salford †
	Per cent.	Per cent.	Per cent.
Loss on ignition	70·4	64·7	54·5
Mineral matter	29·6	35·3	45·5
Total nitrogen (as N)	6·0	4·6	3·75
Phosphate (as P_2O_5)	4·2	2·6	2·1
Greasy matter, &c.—ether extract	7·3	5·8	4·8

* Ardern and Lockett (Journal of the Society of Chemical Industry, No. 10, Vol. xxxiii.).

† S. E. Melling (Journal of the Society of Chemical Industry, No. 23, Vol. xxxiii.).

ANALYSIS OF ACTIVATED SLUDGE (DRY).

The activated sludge produced from the Withington sewage thus has an appreciably higher nitrogen content than either the Manchester or Salford sludge, due to some extent to the fact that the percentage of mineral matter is considerably less.

As stated in previous papers, the high percentage of nitrogen in activated sludge is one of the most important features of the process, in view of its direct concern with the question of the conservation of nitrogen.

SUMMARY OF RESULTS.

The results of the present investigation may be summarised as follows:—

1. That, contrary to the opinion formed as the result of earlier experiments when working with a strong trade sewage, the maintenance of the activity of the sludge is not dependent on the stage to which nitrification is carried.

2. That when dealing with a sewage free from inhibitory trade effluents no appreciable loss of efficiency need be anticipated in this country during the winter months.

3. While the problem of disposal of the sludge remains to be fully developed, it would certainly appear from known data that the cost of dewatering and drying will be more than repaid by the value of the resultant dried sludge.

The investigation in regard to the effect of various trade effluents on the purification process is now well advanced, and it is hoped that the results obtained will shortly be available for publication.

In conclusion, the author has to thank Mr. H. Edwards (Withington Works manager) for exercising general supervision; Mr. G. Smith (laboratory attendant) for intelligent operation of the experimental plant; and Mr. C. Jepson, B.SC., for able assistance in the analytical work involved. He is indebted to the Rivers Committee, Manchester Corporation, for permission to publish these results.

DISCUSSION.

The Chairman (Mr. J. H. Hoseason) enquired what was the effect of auto-digestion on the sludge, and whether it was then more difficult to obtain a stable effluent.

Mr. S. E. Melling was doubtful whether nitrification was, in all circumstances, vital. His experience of the continuous flow method of operation appeared to indicate that, by the use of 25 per cent by volume of activated sludge, very satisfactory purification, notably in the colder winter months, could be obtained and maintained, practically without nitrification. He understood that the only effect of nitrification was to improve the stream into which the effluent passed by providing it with potential oxygen, which, however, was not the prime object of sewage purification. The point was whether the elimination of the ultimate stage of more or less complete nitrification would result in an appreciable saving of time, thus effecting economy in the consumption. One or two hours' treatment by the fill-and-draw method gave results very similar to those quoted in the paper, and conformed very satisfac-

... to the suggested dissolved oxygen test of the Royal Commission. At the same time, the activity of the sludge was well maintained throughout. The ... of 4.5 per cent of nitrogen (Salford sludge) given ... The paper was now increased to 4.5 per cent or ... and for all seasons of the year. Was it ... possible to recover directly the nitrogen in the ... of sulphate of ammonia? There was a very ... excess of nitrogen as compared with peat, and the latter, containing 2·0 per cent of nitrogen and 40 per cent of moisture, had, he believed, amply repaid for the recovery of the sulphate.

Mr. William Thomson asked whether it would be practicable to mix activated sludge with charred peat so that the large quantity of nitrifying bacteria in the sludge could be made available for the culture of vegetables. The charred peat would no doubt aid in the air drying of the sludge. He had Professor Bottomley's experiments in mind.

Mr. Percy Corbett enquired whether any difference in nitrogen content had been observed between the sludge employed for the maximum purification, and the sludge employed for the less complete purification.

Mr. Ardern, in reply, said the effect of auto-digestion of the sludge was to produce turbid effluents. In the absence of disturbance due to the passage of sewage or trade effluents, it was only met with during the initial period when nitrifying organisms were being established in the sludge by prolonged aeration periods. He agreed with Mr. Melling that nitrification was not essential, and consequently, in view of the fact, which had been established, that the activity of the sludge could be maintained without reference to the degree of nitrification, thoroughly well purified effluents could be obtained with a considerably reduced aeration period than was at first thought necessary, with consequent reduction in cost. He believed that the recovery of nitrogen by distillation of activated sludge was a practical proposition, but his view was that it would be better to utilise the dried sludge direct as a fertiliser. Its fertilising value had been thoroughly demonstrated by Dr. Bassu (Illinois University) and Mrs. Mumford (Manchester University). Activated sludge could, of course, be mixed with peat (either before or after inoculation) as suggested by Mr. Thomson, but, seeing that the sludge itself contained appreciably more nitrogen than peat, it did not appear desirable to do so. This suggestion, of course, raised the important question of soil inoculation which had been investigated by Professor Bottomley and others. He believed that the best results would be obtained by the direct use on the land of activated sludge with its normally high bacterial content, as there was every reason for believing that in addition to nitrifying organisms the sludge also contained nitrogen-fixing organisms. In devising means for drying, or partially drying, the sludge endeavour should ... to avoid sterilisation. The practical difficulty was, however, to maintain the organisms in the sludge in an active state, particularly as the demand for manures was seasonal, whereas the production of sludge would be regular all the year round. He had not observed any material difference in the nitrogen content of the partially and completely activated sludge.

Refuse Collection and Disposal.—A discussion on ... will be opened by Mr. C. H. Cooper, M.Inst.C.E., borough engineer and surveyor of ... at a meeting of the Royal Sanitary Institute to be held at 90 Buckingham Palace-road, S.W., on Tuesday, the 27th. The chair will be taken at 6 p.m.

Willesden Paper and Canvas Works, Limited. This company's works, ... were totally destroyed by fire in July last, ... re-opened on Wednesday last, the 14th inst. A number of the company's customers were present, and these, together with numerous other ... expressed ... over the new premises by the directors.

Corporation and Coal Shortage. The coal shortage at Southampton, which recently became somewhat acute, has induced the Electricity Committee of the ... to take the ... step of placing ... portion of their ... stock of large coal on sale ... to certain ... merchants' supplies ... to the ... section in the department, the ... of distribution ... being supervised by the ... members of the committee.

DEVELOPMENT OF ELECTRICITY IN AGRICULTURAL AREAS.

I.M.E.A. COMMITTEE.

At a recent meeting of the council of the Incorporated Municipal Electrical Association, the president, Mr. F. M. Long, referred to a paper read by Mr. Kerr at the annual convention in June last, and suggested that the council should take the initiative in developing the above subject.

The council, recognising the important part that electricity may be made to play in the better cultivation and greater production of the land, and in the extension of rural industries, have formed the nucleus of what is ultimately intended to be a committee representative of all interests with the object of a thorough investigation into the technical and commercial problems underlying the application of electrical energy for such purposes, by forming a small committee with powers to add to their numbers both from the ranks of the association and from other sources—namely:—

S. E. Britton, city electrical engineer, of Chester, chairman.

F. M. Long, city electrical engineer, Norwich.

H. Faraday Proctor, city electrical engineer, Bristol.

J. Christie, engineer and manager of electric supply department, Brighton.

S. T. Allen engineer and manager of electric supply department, Wolverhampton.

F. Ayton, engineer and manager of electric supply department, Ipswich.

The committee will be known as "The Committee on the Development of Electricity in Agricultural Areas," formed by the Incorporated Municipal Electrical Association.

Mr. W. T. Kerr, city electrical engineer of Hereford, has been added to the committee, and two sub-committees have been appointed to deal with publicity and technical matters, with Mr. Kerr and Mr. Long as chairman respectively.

The objects of the committee will be—

(1) To investigate and advise upon the problems underlying the supply and use of electrical energy in agricultural areas for power, lighting, heating, culture, and other purposes for farms, villages, and rural industries.

(2) To collect and collate information, and publish literature bearing upon the above.

(3) To co-operate with agricultural and other associations.

(4) To investigate in co-operation with manufacturers the development, manufacture and adaptation of agricultural machinery, and appliances for utilising electrical energy.

(5) To promote the exhibition of such machinery and appliances at agricultural shows and elsewhere.

(6) To offer assistance in arranging demonstrations and lectures in conjunction with farmers' associations, clubs, &c.

(7) To promote any legislation necessary to facilitate the application of electrical energy to agricultural areas.

When the committee have formulated definite proposals for consideration and discussion, and compiled the necessary data and information, it is intended to invite kindred bodies to nominate representatives to serve on the committee.

All communications should be addressed to Mr. S. E. Britton, city electrical engineer, New Crane-street, Chester.

Sewerage Works for Sydney.—The Sydney Office of H.M. Trade Commissioner in Australia reports that the New South Wales Public Works Committee, in a report recently presented to the State Parliament, has recommended the installation of a sewerage system to serve an area of 12,282 acres, having a population of 308,000, in the south-eastern suburbs of Sydney. The estimated cost of the works is £1,240,000. The committee suggests that operations should be commenced immediately by the installation of the system to such an extent as would serve about 900 acres, at an estimated cost of £312,000. The name of the official under whose supervision the proposed works will be carried out may be obtained by United Kingdom manufacturers of materials and accessories on application to the Department of Commercial Intelligence, 73 Basinghall-street, London, E.C. 2. In making application the reference number (109) should be quoted.

Technical School Buildings: Their Accommodation and Equipment.

BOARD OF EDUCATION MEMORANDUM.

A memorandum on the Teaching of Building in Evening Technical Schools, which has been issued by the Board of Education, contains some useful suggestions dealing with the accommodation and equipment of building school class-rooms, laboratories, and workshops. Extracts from this section of the memorandum are appended:

ARRANGEMENT OF ROOMS.

In order that the best organisation of building classes may be secured, it is highly important that the accommodation set aside for the building department, where such a department exists, should form a compact group of rooms, and be wholly self-contained in respect to use of class-rooms, laboratories, workshops, &c. The work of the department as a whole should be conveniently under the eye of the head of the department.

A frequent source of difficulty in the arrangement of appropriate rooms for building classes in a large building is the disturbing effect on other classes of the noise created in the building workshops. Practically, however, this distraction is only serious in the case of the plumbers' workshop, and in much lesser degree in that of the carpenters' workshop. It may be largely mitigated by arranging that the plumbers' shop is situated at the end of the suite of workshops, or in a contiguous outside room. The distraction mentioned is, however, not likely to be serious in the case of a building laboratory or drawing class, even if its source is an adjoining room, provided that the intervening walls are of a substantial character.

Where the building classes are not organised as a distinct department it becomes still more important that the various rooms should be contiguous in order that the various teachers of building subjects may be in close touch with each other, and so secure co-ordination of the work and the most efficient conduct of the instruction.

In settling the position of building workshops it is important to remember that suitable means of entry into the school for materials must be made, particularly for heavy rolls of lead, pipes, &c., for the use of the plumbing classes, and blocks of stone, timber, bricks, &c., for other classes.

The number and proportions of rooms required will depend upon the extent and nature of the work undertaken. In general, however, the rooms which are indispensable, and which should so far as possible be reserved solely for the use of building students, are those mentioned below.

LECTURE ROOMS.

For certain classes, such as those in building commercial subjects, or building law subjects, an ordinary class-room will prove adequate. But for all other subjects the instruction is such as to require the use of technical exhibits, demonstration apparatus, specimens, models, diagrams, &c., and the class-rooms will in general need to be specially adapted to this end. Further, in all lecture work on building subjects the students will need to be taking sketches, making simple drawings, or examining models during a lecture, and for these purposes the ordinary narrow sloping desk is not the most suitable. In practice it is found that flat-topped desks or tables are most convenient even for the purposes of class lectures in building. Hence the best arrangement is one under which every building class-room is fitted up so as to serve the purposes of *either* a lecture or a drawing class. This arrangement has the further advantage of simplifying the organisation of a department, for when there is no distinction between lecture rooms and drawing offices the rooms may be used indiscriminately, and fewer rooms will thus be necessary for the use of a department. The concentration of the work of a department, as suggested above, will in consequence be greatly facilitated.

In order to illustrate the arrangement and equipment of a combined lecture and drawing room the plan of an existing room is appended. The room is 27 ft. 6 in. wide, 23 ft. 6 in. long, and 14 ft. high. An extra couple of feet or so would be an advantage in the length—*i.e.*, from front to back of this room—but otherwise it is a very convenient one in its dimensions, all students being near enough to hear the lecturer clearly, to see the drawings and sketches made on the blackboard, and to follow the demonstrations made at the lecturer's table. The windows of the room are carried nearly to the ceiling, and give a good light across the room. Battens on the vacant wall-space provide attachment for diagrams. The floor is covered with cork linoleum, which deadens all sound from shuffling feet or stools and minimises dust. The tables or benches are 2 ft. 9 in. high, and flat-topped. They are very substantially constructed, so as to reduce vibration during drawing practice, the faces being made of 2½-in. planks, and the framing of 4-in. by 4-in. quartering. Runners for storage of drawing boards are provided under the table tops, and substantial foot-rails are attached to the framing. The stools which were originally provided have been replaced by short forms, the latter being less liable to be toppled over by careless students, while at the same time they admit of a student so desiring to stand at his work by merely shifting backward his end of the form. The benches are arranged to accommodate a maximum of thirty-six students for lecture purposes, or twenty-four students for drawing practice when imperial drawing boards are used. The lecturer's table is 2 ft. 9 in. high, and the lecture platform is elevated one foot above the floor. The sliding blackboard is 12 ft. long by 5 ft. 9 in. high, and very substantially constructed. It is hung on 9-in. pulleys, the single counterweight moving in a side boxing. The space behind the blackboard is fitted with shelves, and there are glass cupboards at each side for storage of small models and specimens of materials. Attached to and in front of the lecturer's table are vertical folios, made of three-ply wood, to hold students' drawings. At the side of the room is a bench for exhibition of large models, and there is also an additional rack for drawing boards and T squares.

DRAWING OFFICE.

A room of the type described above serves the purpose of a drawing office as well as a lecture room. Sometimes, however, a separate drawing office is desired specially for the use of students engaged in advanced design in connection with which no lectures or demonstrations are provided. The drawing tables in this case may be single or dual spaced well apart, and office stools substituted for forms. Such accessories as an electric printing apparatus and washing trays for blue printing or other copying processes may be accommodated in this room.

In all rooms used for drawing purposes a good system of artificial lighting is important. This should be so arranged that no disturbing shadows are cast on the paper. With a suitable ceiling, or with special reflecting shades, excellent results can be obtained by indirect lighting, in which only reflected or diffused light reaches the drawing board. A somewhat more economical arrangement is that in which high-candle-power incandescent lamps are used, either singly or in groups. The dazzling effect of the direct rays of the lamps may be avoided by the use of semi-transparent shades or globes, while reflecting shades fixed above the lamps supply further diffused illumination. Holophane globes or shades, if judiciously selected, may be made to fulfil the same purpose. Where in existing rooms there are incandescent lamps with ordinary opal shades, a strikingly improved effect may be obtained by simply inverting the lamp and shade so that the light is reflected from the ceiling. In this case, however, it is essential that the shades should be frequently cleaned, as dust settles on the inverted shade, and reduces its reflecting and transmitting capacity.

LABORATORY.

(a) General Requirements. A suitable laboratory is an essential feature of any satisfactory scheme of building education. Steps should be taken in all cases where no such accommodation is available, either to specially erect a building laboratory or to

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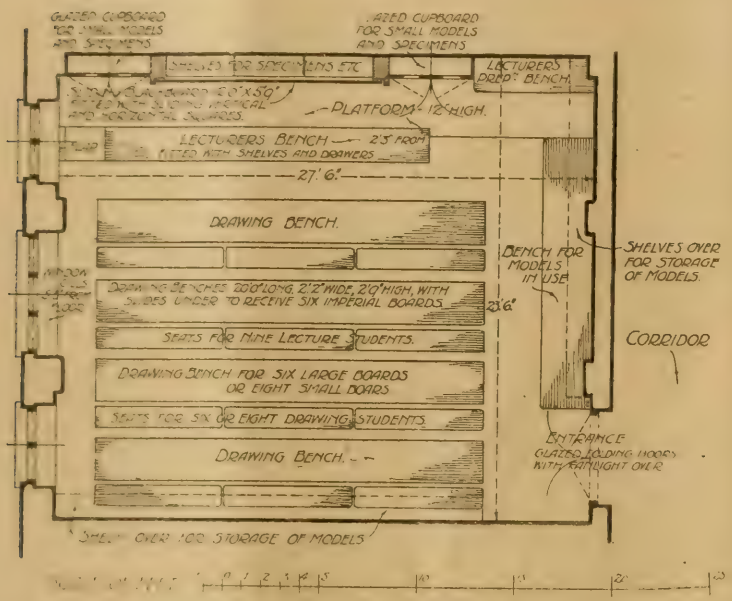
make the necessary adaptation for that purpose of an existing room.

For the work of a senior course an appropriate size for the laboratory is about 1,200 sq. ft. In a small school, where considerations of space are very important and where the class numbers less than twenty students, useful work may, however, be done in a laboratory that is not more than 800 sq. ft. Preferably the laboratory should be located on the ground floor on account of convenience for the drainage and sanitary experimental work. It is, however, an advantage to have the room contiguous to the building construction lecture rooms. The laboratory floor should be of hard, impervious material, and the finish of the wall surfaces as simple as possible. If the walls are of brick a [illegible] pointing only gives a very suitable finish. The height of the room on at least one side should be not less than 12 ft., in order to permit of the erection of complete hot-water circulation and drainage apparatus, &c. It is desirable that on this side there should be a minimum of window space so as to afford space and freedom for the erection of the [illegible] &c.

Roughly, speaking about one-third of the floor space should be allocated to that experimental work which is likely to introduce mud and dirt, and for which the use of considerable quantities of water is necessary. Such experiments are those related to the investigation of floors, [illegible] space for this work will usually be at one end of the laboratory, where there will be a suitable arrangement of water fittings, sinks, &c. The room may be so arranged that it can be used for ordinary class work as well as for experiments, and must be provided with a blackboard. The tables should have plain flat tops; they should be firm, but not too heavy or too long to be easily moved; they need not be very wide. Small bracket tables attached to the walls are useful for students to write up their notes and observations while conducting experiments.

There should be ample cupboard room, but this should be provided with the least possible sacrifice of wall space. One or more smoke flues should be provided. There should be ample gas and water supply, the latter in sufficient quantity to conduct experiments on flushing and syphonage appliances and devices. Good connections to drains for drainage experiments should be made (a manhole may be built in the room), and gully traps should be arranged to intercept plaster and cement residue.


GLAZED CUPBOARD FOR SMALL MODELS AND SPECIMENS
GLAZED CUPBOARD FOR SMALL MODELS AND SPECIMENS
SHELVES FOR SPECIMENS ETC.
LECTURERS DROP BENCH
PLATFORM 12" HIGH.
LECTURERS BENCH — 2'3" FROM
FITTED WITH SHELVES AND DRAWERS
27' 6"
DRAWING BENCH.
DRAWING BENCHES 20'0" LONG, 2'2" WIDE, 2'9" HIGH, WITH SLIDES UNDER TO RECEIVE SIX IMPERIAL BOARDS
SEATS FOR NINE LECTURE STUDENTS.
DRAWING BENCH FOR SIX LARGE BOARDS OR EIGHT SMALL BOARDS
SEATS FOR SIX OR EIGHT DRAWING STUDENTS.
DRAWING BENCH.
BENCH FOR MODELS IN USE
SHELVES OVER FOR STORAGE OF MODELS.
23'6"
CORRIDOR
ENTRANCE
GLAZED FOLDING DOORS WITH FANLIGHT OVER
SHELVES OVER FOR STORAGE OF MODELS

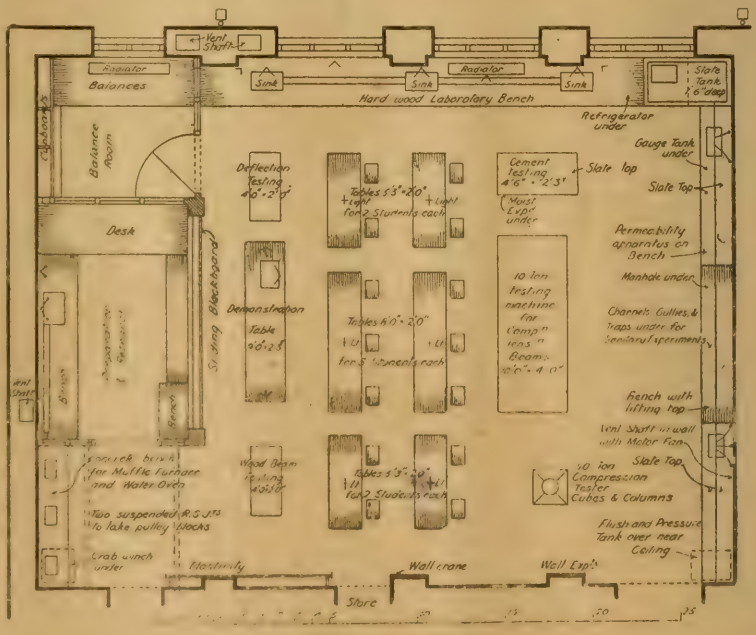
Combined Lecture and Drawing Room.

(b) Plan of Fittings.

Subject to the above requirements the detailed arrangement of the laboratory fittings lends itself to variety of treatment. The appended plan of a building laboratory will be found suggestive. The accommodation in this is adequate for a class of about twenty. The larger machines suitable for a building laboratory are indicated on the plan.

WORKSHOPS.

The workshops should, as a rule, be from 600 to 1,000 super. ft. in area for a class of sixteen to twenty students. Concrete floors will serve for brickwork, masonry, and plumbing workshops, but in the carpenters' shop wood should be used. The benches should be strong and heavy, those in the masons' shop especially so. The plumbers' shop should have centre benches for pipe work, and the fireplaces or gas-heaters should be arranged so that students do not need to carry molten metal across the shop. The masons' shop should have ledges for setting-out



Building Laboratory.

boards. All workshops should be provided with blackboards, and with ample cupboard accommodation for storage of tools, finished work, &c.

ADDITIONAL ACCOMMODATION IN LARGER SCHOOLS.

In the larger schools, where a considerable number of grouped courses are established, or where there are advanced courses, it will be desirable to provide additional accommodation in order to secure efficient organisation and adequate equipment for effective teaching of the higher and more specialised subjects. Following are some outlines of the provision which has been made in certain higher schools and institutions.

BUILDING MUSEUM.

The assemblage of building models, specimens of materials, diagrams, and building and sanitary appliances, is so great in a large school that it is impossible suitably or properly to store them in the ordinary class-rooms. Failing proper facilities for storage, it frequently happens that there is no effective use of a large part of the valuable and necessary apparatus, and a museum of the kind suggested becomes a necessity. The museum should be provided with a sufficiency of glass cupboards for the storage and exhibition of specimens of material and similar objects. Specimens and appliances should in every case be suitably labelled, and should have a short description attached. For, apart from class use, specimens and appliances which are thus labelled afford students a useful means of employing in private study such time as they may have available. Models should also be kept in cupboards so that when required for drawing lessons they may not be too dusty for the students to handle. Building appliances, specimens of building "furniture," bolts, locks, &c., and patent devices used in building should be stored or fixed in appropriate positions. Before fitting up this room teachers are recommended to visit and note the arrangements made at such places as the Parkes Museum, London, the Highgate Sanitary Museum, London, and the Geological Museum, London.

SETTING-OUT ROOM.

This should be a large room (a covered-in area of any kind answers the purpose), where students of practical trade classes may set out work on a big scale (the room in this respect corresponding to the mould loft of a shipyard), or where they may erect such exercises in practical work as are too large to be accommodated in the ordinary workshop. The exercises referred to are such, for instance, as:—A system of drainage, brick walling, arches, or groins; tracery windows; roof trusses; staircases; hot-water circulation apparatus. It should be pointed out in this connection that many of the workshop exercises executed in building schools, such as models of stone vaulting, brickwork niches, or wood staircases, lose a good deal of their educational advantage through being carried out on a very small scale. Moreover, the time and labour involved in carrying out some of these exercises to a small scale is little less than if they were executed full size.

The setting-out room or area may also serve to provide the necessary space for certain indoor exercises of the surveying classes during the winter months.

STUDIO AND LIBRARY.

In some schools a special room is set aside for the use of advanced classes in design, where plaster casts, sets of architects' drawings, and photographs of buildings may be placed to advantage. A small library of books and current trade periodicals is also useful as affording means of reference and an appropriate place for private study by the students.

Prevention of Flooding in Buildings.—We have received a communication stating that the heating chamber to the Grimsby and District Hospital has been a source of much trouble on account of flooding after heavy rains. The difficulty has been overcome by giving the floor and walls a Pudloed cement rendering.

Manchester's Gas Undertaking Deficit.—The Manchester Corporation Gas Committee have intimated to the Finance Committee that, "inasmuch as it is probable that there will be a deficiency of £100,000 on gas revenue account on March 31, 1917, they cannot see their way to make any contribution in aid of the city rates next year." The Gas Committee have for many years contributed £50,000 a year in aid of the city rate.

THE METRIC SYSTEM.

ADVOCATED BY CHAMBERS OF COMMERCE.

At the annual meeting of the Association of Chambers of Commerce, held in London this week, a discussion took place on a resolution moved by Mr. Gerald Stoney (Newcastle) urging the Government to pass a Bill adopting the metric system.

Mr. Stoney contended that if the metric system were adopted by the British Empire America would follow at once. The change would effect a considerable saving in our system of education, for it was calculated that 10 per cent of the time spent in schools was devoted to our "abominable system" of weights and measures. It was curious that the chief opposition to the change came from engineers and manufacturers, who urged that their gauges, &c., were in the English system; but he pointed out that the adoption of the metric system was proposed to be compulsory for buying and selling and optional in regard to other purposes.

Mr. B. Barker (Birmingham), in seconding, declared that it was time we enlarged our minds and dispersed some of our narrow views if we were going to hold our trade in the world. The metric system ought to be adopted on the grounds of its inevitability. It was the universal trade language, and we resisted it to the detriment of our trade. Germany had taken up the metric system and carried it through in two years, and he deplored that opposition to its adoption in this country came chiefly from people who did not understand it, and who flatly declined to learn. In Whitaker's Almanack there were 125 denominations and multiples of everything from 5¼ to 112, which one was supposed to know something about if he were to keep in touch with the commerce of the world. Was it worth while learning all this?

Mr. John McLaren (Leeds) opposed the motion. He admitted that from the academic point of view the question was attractive. In the early days he was an advocate of the metric system, but it was a very large proposition to suggest that all the drawings and patterns made by engineering and shipbuilding firms at enormous cost should be scrapped because of a change in the system of measurements. The drawings and patterns of a machine were more costly than the machine itself, and they were all made on the English system of measurements. He could not agree that the use of the metric system was inevitable. Certainly it was not inevitable at the present time, nor had it become an acute question.

Mr. E. Manville (Birmingham) considered there was no difficulty in adopting and working under the metric system. The only serious consideration in the adoption of the system was that a sufficient period of time should elapse between the adoption and its enforcement throughout the country. That period ought not to be less than five years.

Mr. A. J. Hobson (Sheffield) said he did not dissent from the desire for a simplification of our measures, but thought that people who advocated the change had not viewed the facts rightly. In adopting a new system no nation had ever faced so enormously costly a change as this country would face, because no other nation had such an enormous quantity of drawings, jigs, dies, patterns, &c., as we had, and he could not quite see why this burden should be forced upon our engineering industry just now.

The chairman (Sir Algernon Firth) observed that a Bill had been introduced into the United States Congress for the adoption of the metric system in 1920. It was, of course, not certain that the Bill would be passed, but it showed that there was a body of opinion in America in favour of the change.

The resolution was carried by a large majority.

On Tuesday next, the 27th inst., at the Institution of Civil Engineers, Mr. Harry Allcock, M.I.E.E., A.M.I.MECH.E., will deliver a lecture on "The Decimal System of Coinage, Weights and Measures." Members of the Institution of Mechanical Engineers, naval architects, and electrical engineers, and of the Iron and Steel Institute, are invited to attend the lecture, which will commence at 5.30 p.m.

London Street Lighting.—Wandsworth Borough Council have addressed to the Home Secretary a suggestion that during the coming summer months public street lighting should be dispensed with in London, except in the main arteries of traffic.

Some Observations on Municipal Housing.*

By JOHN H. MOLE, Surveyor, Chester-le-Street Rural District Council.

The Housing of the Working Classes Act, 1890, had many shortcomings, which rendered it in a large measure inoperative. This was especially so in rural districts where it was adoptive, a fact which left a very wide loophole of escape from its obligations. Besides, the powers for the acquisition of land were very inadequate, the maximum rate of interest was fixed for the necessary loan, and the term of years for repayment was too restricted.

These facts together with the apathy of local authorities, and the bogey of a probable charge on the rates, which was always being raised by those who were personally interested in the Act, remaining a dead letter, resulted in only ten rural and a very moderate number of urban authorities availing themselves of its provisions prior to the passing of the Housing and Town Planning Act, 1909, notwithstanding that throughout the length and breadth of rural England there has scarcely been a spare habitable cottage for many years past.

The Act of 1909, together with other facilities arranged for about that date by the Local Government Board and the Treasury, removed quite a number of obstacles, with the result that between the time of this Act becoming operative and the middle of 1914 the Local Government Board had sanctioned schemes for the erection of approximately 6,000 houses at a cost of £1,250,000.

Indeed, at the outbreak of the terrible world-conflict which is at present robbing the leading nations of the world of the flower of their manhood, the majority of the more progressive local authorities in this country had embarked or were considering the advisability of embarking in a house-building scheme.

Quite a number were also proposing to avail themselves of the Town Planning provisions of the 1909 Act. When one looks around at the incongruous conglomerations of dwelling-houses, stables, shops, factories and workshops promiscuously jumbled together in a variety of ways to suit the caprice or other incentives of the owners of the several building plots which go to make up the older parts of our towns and villages, or when one has to traverse in these days of rapid vehicular traffic some of those tortuous ways which have to serve as main thoroughfares, it is calculated to engender the wish that town planning had made its advent at least two centuries ago.

LOAN PERIODS.

Although the Government have now made the compulsory acquisition of land for building schemes possible, have arranged a method for regulating the rate of interest to be paid for the necessary loan, which, prior to the outbreak of war was 3½ per cent, and have extended the repayment periods to eighty years for the land, sixty for the houses, thirty for the sewerage and water mains, and only for the street works, and although the former it is questionable whether they have gone far enough, they might and could with advantage have gone further to facilitate municipal housing operations. One way in which they could in my opinion most materially assist such schemes would be still further to modify the repayment periods for the money borrowed.

To illustrate, let it be accepted that the eighty years as the longest repayment period for the land, although I see no reason why that and should not be on equal terms as a private [illegible] more remote.

Now, with regard to the maximum of sixty years for the houses, I daresay most of us could refer to houses [illegible] which have withstood the ravages of time for over 100 years, and are still likely to do so for some considerable time to come. While I unhesitatingly affirm all houses erected by local authorities [illegible] but should be equally [illegible] to those referred to, and contend that there can be no valid reason why the repayment period for the loan to erect them should not be [illegible] years.

Then take the thirty years for sewers and water mains, and the seven years for street works. I contend that these periods ought to be and against extended to the repayment period for these to eighty years [illegible] in the case of the former. The sewers and for the following reasons: Take the sewers. Once they are completed and in use, the local authority becomes responsible for their maintenance, and it matters not whether they go out of order in five, ten, or fifty years after, they have to be put into order at the expense of the local rates. Then, with reference to the water mains, whether it be a private company or the local authority that furnishes the water supply, provision is always made in the water charges, not only for the cost of the water, but for the perennial maintenance of the pipes to convey it. How, then, can it matter whether the repayment period be thirty years or eighty?

Now we come to the street works. Directly these streets are made up to the satisfaction of the surveyor of highways they can be, and generally are, taken over and become repairable by the public at large; consequently the remarks with reference to the repayment period for the sewers and water mains applies with equal force to them.

RATES AND TAXES.

Taxation is another item to be provided for, and it has been held that local authorities ought to have exemption from the payment of income tax in connection with their schemes of workmen's dwellings for the same reason that co-operative societies have exemption from it—viz., because it cannot be proved that their members collectively have an income which exceeds in amount the abatement allowance mentioned in income tax schedules.

Then we have local rates, which, next to the loan instalment and interest, is the largest item on the outlay side of the housing balance-sheet. Some authorities maintain that it ought to be possible to effect considerable reform, and consequently economy, in this, and in the following way: Under the provisions of secs. 3 and 4 of the Poor Rate Assessment and Collection Act, 1869, it is possible (for houses the rateable value of which does not exceed £8) to effect an arrangement whereby, if the rates be undertaken to be paid by the owners, whether the houses are occupied or not, an allowance is made to them under sec. 3 of 25 per cent, and under sec. 4 of 30 per cent of the rates chargeable. Were this allowance to owners permitted to be made for houses up to £12, or even £10 rateable value, it would certainly be a great saving in rates for these houses of lower value.

The possibility of reducing the rate of interest to be paid for the borrowed money is also deserving of careful consideration, and I have heard it contended by more than one well-informed advocate of housing reform that it might be done through moneys deposited with the Government in the Post Office Savings Bank.

Certain financial returns show that prior to the outbreak of the present war there was deposited in this way over £180,000,000, and that the rate of increase in this deposit was something like £1,500,000 per annum. The annual rate of interest paid for this vast sum is, as is well known, only 2½ per cent, and it is held that loans for housing purposes could have been made from moneys thus deposited at 2¾ per cent, the ¼ per cent being amply sufficient to cover administrative expenses. Had even the £1,500,000 annual increase in deposit been lent on these terms to local authorities for housing schemes, over 7,100 houses, at an average cost of £210 each, could have been erected annually. This would have had a material effect in alleviating the existing house famine, and in making it possible to dispense with many houses unfit for habitation which are at present occupied.

The conditions enumerated, if permissible, should very materially affect the balance-sheet for the housing scheme, and would certainly enable authorities either to build a better house and let it at the same rent as at present, or a house similar to those erected under the old conditions and let it at a less rent, whichever they shall decide is most desirable.

THE QUESTION OF STATE AID.

I believe that there are some who would even go to the extent of advocating State-aided housing schemes, and if one is to believe, what cannot very well be denied, that better housing conditions mean a better national bill of health, there may be something to be said in favour of this view.

It has been held that the insanitary and otherwise

* Extracts from a paper read at the last annual Northern [illegible] of the Institution of Municipal Engineers, and awarded the Institution's premium for the year 1915-16

defective housing conditions are in a large measure responsible for the cases which go to fill our sanatoriums, infectious diseases hospitals, asylums and union workhouses; establishments which are not only provided but maintained by our rate and tax funds.

If this state of affairs could to any appreciable extent be alleviated by the provision of better housing, then State-aided housing reform is deserving of serious consideration. Not only would our hospital, &c., expenses be curtailed, but the loss to the nation entailed by premature deaths, and the suffering with, in many cases, permanent injury to health that results from those cases of illness which do not terminate fatally, might be avoided.

Moreover, it can surely with as fair a show of justice be held that it is as noble and patriotic to sanction the investment of a nation's funds in schemes for the promotion of the physical welfare of her people as it is to spend it in the establishment and maintenance of those existing palatial public institutions which are calculated to improve their intellectual endowments.

DECLINE OF PRIVATE ENTERPRISE.

For some years prior and subsequent to the birth of the present century private enterprise seemed to meet the needs of the people so far as numbers of houses erected were concerned. About that time there were in the rural district in which I am engaged from 400 to 500 houses erected annually in this way, and in one year the maximum of 625 was reached. During the last few years, however, it has almost completely fallen away, so much so that we are now having only about 10 per cent of the numbers quoted erected by private enterprise. This falling off is, I believe, not only local, but general throughout the country. Many of these speculative builders were upright business men, who built a decent house, and were prepared to dispose of it at a reasonable price; but there were others whose standard of commercial morality was too low to entitle them to deal in even the most commonplace commodity, and I know that there are many persons who to-day regret the hour that they invested their money in houses built in this way.

Whether owing to more remunerative means of investing capital having presented themselves, or for some other reason, the business of building houses for sale is at a very low ebb, and I do not think that the British public need regard it as a very deplorable circumstance if it never revives, as it has opened out the prospect for municipal housing, which ought to be better and cheaper in every way.

In carrying out a municipal housing undertaking from its inception to the completion and occupation of the houses there are many points to which special attention should be devoted, the most obviously essential of which may be enumerated as follows: (1) The selection and purchase of the site; (2) the laying out of the land; (3) the planning and erection of the house; (4) the financing of the scheme; (5) the tenant and the management of the property.

I now propose to take each of these salient points and deal briefly with them seriatim.

THE SELECTION AND PURCHASE OF THE SITE.

In selecting the site every care should be exercised to ensure that it is conveniently situated, having regard to the centres of industry whose workers it is intended to serve; the possibilities of securing efficient and economical drainage, water supply and lighting, and proper and reasonable access to main roads and railways. The land should be suitable, with a dry subsoil; it should have a gentle slope, preferably towards the south, with the object of obtaining easy and natural surface-water drainage, a fair share of the benefits of sunshine, and some prospect of shelter from the worst winds of winter. It is common knowledge that a fair price for agricultural land is £30 to £40 per acre, which is fifteen to twenty years' purchase for land let at £2 per acre, and this is above the average rent. This price works out at something like 1¾d. per super. yard. Directly, however, this self-same land is requisitioned for building purposes its value instantaneously jumps up to about 3s. per yd., or £726 per acre. This may be a legal method of doing business, but it does not appeal to me as being a very equitable one. The only redress, however, available to a local authority is to appeal to the Local Government Board, who can, by a process of arbitration and local public inquiry, fix the amount to be paid for land. Care should be taken to see that there are not too restrictive conditions imposed in the conveyance of the land, and in mining districts that adequate support is guaranteed by the royalty owners.

THE LAYING OUT OF THE LAND.

There may be diversity of opinion as to whether the detached, the semi-detached, or more or less lengthy continuous street system of cottage building is to be preferred. If, however, economy is to be a consideration, and I submit that it ought to be, there can be no two opinions; for it is to be noted that every time you break the continuous line of buildings there is extra cost in carrying your sewer, water main, gas pipe and street making past the openings between buildings, and there is also an extra gable wall, value £22 to £24, to every block of buildings. Besides, a party wall is always drier and warmer than a gable wall, and in a continuous block of houses of even moderate length there is always probability of better shelter than there is in the case of detached or semi-detached buildings. I do not, of course, advocate abnormally long streets, but consider blocks of eight or ten houses to be reasonable and economical. Where large gardens and only a limited number of houses per acre are desired to be provided, this can be effectively arranged in the case of continuous blocks by giving the land at the front or rear of the houses.

As to the number of houses per acre which ought to be allowed to be erected, I think fifteen to twenty is reasonable. It is all very well to preach from the text of "Back to the land" or "Three acres and a cow," but it does not work out in practice. I know that there are those among our town dwellers who, when they see a comfortable-looking farmer complacently jogging along the road on his stout and well-fed pony, or it may be driving into the nearest market town, accompanied by his rosy-cheeked daughters with their well-filled baskets of pale golden butter, rich brown eggs and plump chickens, are disposed to think that the tilling of the soil is, to use an Irish phrase, "All roses and crame." In spite of all this, however, it is not a case of back to the land in recent years, but its very antithesis—off to the town—and if we are to go in for the six houses to the acre which some advocate, and ask the occupiers, who have to earn their living by the sweat of their brows, to keep this large garden space in a respectable state of cultivation, a good many of them will soon desire to be off to where there is less gardening to be done, for that which ought to be a pleasure will become a labour.

The question of the length and width of streets will be largely governed by the by-laws in force in the district where the houses are to be erected, but it is possible to get approval to a by-law permitting an avenue of 12 ft. width instead of the usual 36-ft. macadam front street, provided the distance between the houses on opposite sides of it be not less than 60 ft., the avenue to be of moderate length and open out on to a proper street at both ends. This is a means of effecting economy in street making, and, at the same time, not diminishing the open space about the buildings.

The question of the back street has for some time been a contentious one, but I still uphold its retention on the grounds of convenience to the tenant, and efficiency and economy in scavenging, especially in those coal-mining areas where the workmen get a large quantity of indifferent coal as part of their wages. The council by whom I am employed have recently, on two occasions, rejected plans for a number of houses on the grounds that a back street was not being provided. The prospective builders have appealed to the Local Government Board, who have written asking for our observations. These observations have been sent on; they present a good case from the district council's point of view, and there an interesting point stands at present.

THE PLANNING AND ERECTION OF THE HOUSE.

Generally there will be a demand for two types of house, one for larger and the other for smaller families. The smaller house should consist of a good large kitchen, a scullery, a small bath-room, and a decent pantry on the ground floor, with three bedrooms over; while the larger house should have the addition of a front room or parlour. The smaller house can be built on a site of 17-ft. frontage, with a 28-ft. gable; and the larger on an 18-ft. frontage, with a 29-ft. gable. The height of rooms which I advocate is 9 ft. for down and 8½ ft. for upstair rooms. Each house should have a supply of hot and cold water, sufficient closet accommodation, a fireplace in two bedrooms, a water-closet, and other conveniences, and a concreted area at the rear with every part of its surface sloping to the drain gully.

In preparing plans for houses on these lines it is desirable that everything should be done which can be done without incurring much extra cost to make

the electric [illegible] to the eye. Care should, however, be exercised to avoid the sacrificing of utilitarian advantages for the sake of securing artistic appearance, as to this end, to my mind, be more disappointing than to see a house with its hipped rafters, peaked gables, ornamental roof and dormer windows, and on entering it be confronted with crooked stairways, and badly arranged rooms of insufficient height.

FINANCING OF THE SCHEME.

I propose to deal with this section of the subject in the light of prices which obtained in normal times, and so ignore the abnormal prices which prevail at the present time.

An important item in connection with the financing of the scheme is the preparation of the annual balance-sheet. As this is in a great measure governed by the initial cost, a commencement should be made by summarising the following:—

The cost of the land, which will vary according to locality.

The cost of the buildings, which ought on an average to be about 4d. per cubic foot of their capacity.

The cost of the sewering and water supply.

The cost of street works.

The cost of fencing, and having added a sufficient amount for legal, &c., expenses, you have the amount to be borrowed.

The Public Works Loan Board is, of course, the proper source from which to secure the loan, and there are two methods by which the repayments may be made:—

(1) The annuity system, whereby an equal annual sum is paid throughout the entire repayment period.

(2) The instalment system, by which an equal annual amount of the principal is repaid, together with interest on the amount remaining unpaid. By the latter system the total repayments are somewhat less; they are, however, rather high during the early years of the repayment period, so that, in my opinion, the annuity system is to be preferred for housing schemes, where the repayments have to be made from the rents collected.

You can now prepare the expenditure side of the balance-sheet by calculating the payments for the land, buildings, sewering, street works, &c., at their various terms of years, and although the method of calculation is too complex to be described here, at 3½ per cent for a sixty years' repayment period it works out at £4 0s. 2½d. per £100 per annum. To this you must add the annual payments for rates, taxes, water charges, insurance, collection of rents, and 10 per cent of the gross rents which the Local Government Board require to be allowed for the maintenance of the property. From a summary of these items you will be able to fix the rents, which are the income side of the balance-sheet, so that their total will be even with the amount on the expenditure side.

A point which is deserving of special attention in the fixing of rents in districts where an allowance to owners is made for houses of low rateable value, is the exact rent to be charged for the two classes of house. I hold that an owner is entitled to this allowance for all houses up to 5s. 8d. per week rent, and that unless he can get 6s. 6d. per week, or more, it will pay to let them at 5s. 8d. and secure this allowance.

THE TENANT AND MANAGEMENT OF THE PROPERTY.

In the selection of tenants, preference should be given to those workers who are either lodging or having to travel long distances to work in the locality, and to those who occupy houses considered unfit for habitation, provided the latter are persons in a position to pay the rent. It is to be noted, however, that sec. 63 of the Housing of the Working Classes Act, 1890, prohibits those in receipt of poor relief from occupying houses erected under the Housing Acts.

For the guidance of the tenant in the protection of the property, &c., a code of regulations should be prepared, these to be inserted in the rent books, and their observance strictly enforced.

It seems [illegible] to me that it would be a good thing if the tenant would become the owner of the house he occupies by making a certain deposit at the outset and paying weekly or fortnightly, as the case may be, an amount more than what would represent a reasonable rent as his financial circumstances will permit of. This would not only encourage national thrift, but would be conducive to the more orderly keeping of the house, as it is only reasonable to expect that greater care would be taken of the property by the purchaser than the ordinary tenant.

Arrangements somewhat analogous to this can be made under the provisions of the Small Dwellings Acquisition Act, 1899. This is an adoptive Act, in which it is provided that local authorities may borrow moneys from the Public Works Loan Board, and make advances to the occupier of any house within their district, for the purpose of enabling him to purchase that house. The advance shall not exceed four-fifths of the ascertained value of the house, and shall not in all exceed £300 for a freehold house, or a leasehold if not less than ninety-nine years of the lease is unexpired, nor £240 for other houses. Interest is charged at ½ per cent more than the rate paid by the authority, the repayments are to be in periods not exceeding six months apart, and in sums of £10 or multiples of that sum. I am not, however, aware that this has ever been applied to municipally erected houses.

In conclusion, if better housing means better health, then the construction of a sufficient number of healthy habitations is of paramount importance, for it is to be noted that in this country practically every person spends more than one-third of his existence within the four walls of a dwelling-house. And even though it be a somewhat costly matter to provide and maintain that house in the best hygienic condition, it is money well spent, for I venture to assert that there is not one of us who, if badly afflicted, would have the temerity to say that good health was dear at any price.

UTILISATION OF WASTE FOOD AND PAPER.

LORD RHONDDA'S CIRCULAR TO LOCAL AUTHORITIES.

In a circular to local authorities Lord Rhondda draws attention to the importance at the present time of utilising waste food, particularly fat and bones, and other organic waste both of animal and vegetable origin, and also waste paper, cardboard, &c., wherever this is practicable.

WASTE FOOD, ETC.

Co-operation in the collection of waste food was suggested in a circular of January 5th on the subject of pig and poultry keeping. Recent inquiries which have been made indicate that very much more is being done in some districts than in others, and Lord Rhondda wishes to urge upon all local authorities the desirability of every possible step being taken to secure that waste food is collected and utilised either directly or through contractors, or by means of voluntary associations.

Special provision appears generally to be made for collecting and using the waste from hotels, restaurants, schools, canteens, clubs, and other large establishments. It is suggested that each local authority should ascertain whether all that can be advantageously done in this way in their district is being done. If it is not, they should immediately consider what measures can be adopted for using the waste as food for pigs, rabbits or poultry; it may be sufficient in some cases to draw attention to the opportunities which exist of obtaining waste for pigs or other stock. In the case of private households, except where the householder keeps stock of his own for which the waste of the household is being used, a number of inhabitants may be induced to combine together for the utilisation of waste which can be collected by or on behalf of those who can make profitable use of it.

At some places special measures are taken for utilising the waste of slaughter-houses and condemned food, and Lord Rhondda asks local authorities generally to consider what can be done in this respect in their districts. He also emphasises the special value of bones and fat for the production of glycerine for munitions purposes.

The separate collection of bottles, jars and tins, he points out, will also be found to be profitable at the present time.

WASTE PAPER.

The new restrictions on the importation of paper have made it more important than ever that the greatest economy should be practised in the use of paper, and that all waste paper should be utilised. In many districts the collection of waste paper, cardboard, &c., is already undertaken by waste-paper dealers or through voluntary organisations, and it is not suggested that there should be any interference with these methods of collection. More can, however, be done, and Lord Rhondda hopes that all local authorities will use their best endeavours to stimulate action. Waste paper should not be burned in dust destructors and local authorities should

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arrange where possible for its separation from other refuse, if collected at the same time. Householders should be urged through the local Press to keep it separate from other refuse.

Lord Rhondda has been in communication with the Royal Commission on Paper, and has received from them a list of paper mills in England and Wales which use waste paper. Local authorities are advised to put themselves in communication with any of these mills which may be in their neighbourhood or readily accessible.

The present price of waste paper enables many voluntary organisations to collect it and dispose of it at a profit. Boy Scouts, Girl Guides, Church Guilds, and other similar bodies have been usefully employed in this work, the proceeds being devoted to charitable purposes in connection with the war. Local authorities are asked to encourage this movement.

It is understood that for the profitable disposal of waste paper it should be sorted into the following grades: (1) Old ledgers and account books; (2) letters and envelopes; (3) old newspapers; (4) books and pamphlets; (5) brown and wrapping paper; (6) cardboard, strawboard, &c. It will no doubt be found that the mills will wish to receive their waste paper from local centres in comparatively large consignments, preferably not less than 2 tons, and, where possible, it would be desirable to compress the paper, when sorted, into bales before dispatch.

While offering the foregoing suggestions, Lord Rhondda leaves to local authorities the precise measures to be adopted, but he desires to impress strongly on them the importance in the first place of reducing preventable waste, and, secondly, of making profitable use of such waste matter as is unavoidable.

Timber Hauling and the Roads.—At the last meeting of Devon County Council Mr. G. C. Davie suggested that note should be carefully made of the enormous amount of damage being caused to the roads by the hauling of timber for Government work, with a view to claim being made upon the proper authority for a contribution towards repair. Mr. Hurrell said every district council had been notified about this, and in fact a Government official had actually been sent down to one district to see the damage, which would be paid for by the Road Board. Earl Fortescue suggested that a record should be made of the desire of the council that the committee should take note of any roads being damaged in this way with a view to bringing it at the proper time before the Road Board, and this was agreed to.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Has not the abolition of newspaper posters made a very marked difference in the cleanly appearance of the London streets?

* * * *

What can be the reason for the *Auto* of March 2nd last taking up such a strong position against the endeavour of the "Safety First" Council to alter the foot-passenger rule of "Keep to the right" to "Keep to the left"? What have country roads, without any footpaths at all, got to do with the question? And does not the whole article remind one of the objections to the Daylight Saving Bill which were usually advanced by people who did not in the least understand the question? Is it not always a most difficult thing to overcome habit and custom? And yet when any good reform is carried out, and we see the advantages, do we not say, "Why on earth was not this thought of before"?

* * * *

Was there not a very interesting account given recently of the construction of a concrete road in Dunfermline, Scotland, in place of one paved with whinstone setts, which was broken up by motor-'bus traffic? Is it not also satisfactory to learn that the work when completed presents an excellent surface, is practically noiseless, and that it is hoped it will have considerable lasting powers? Is it not refreshing to find that such work is being executed in Scotland, and may we not hope that properly constructed concrete roads will some day "come to their own"?

* * * *

Is it a fact, as stated in the *Times*, that quite recently the War Office selected a 22-acre field of young wheat on which to erect a camp, whereas on the opposite side of the road there was a field of "poor grass" which was quite as suitable for the purpose? Does it not seem strange that, while on the one hand the Board of Agriculture and the Food Controller are clamouring for more land to be put under wheat cultivation, and pointing out the grave necessity for this, the War Office appeared in this case to have been utterly regardless of these requirements? When shall we get a better correlation between the various Government Departments?

* * * *

How will the various local authorities throughout the country act in the matter of the Local Government Board circular dealing with the saving and collection of waste paper? Is there not a general complaint among householders at the present time that when they have, at considerable inconvenience, saved and stored waste paper, no one will take it, and they have to burn it or put it in the dustbin? Although in a few districts a system of collection has been arranged, why cannot some organised system be introduced throughout the country to facilitate the collection, and even pay a small sum per hundredweight to those who have taken the trouble to collect and store the paper?

* * * *

Is it not evident that one of the effects of the war has lately shown itself in the manner in which broken granite and other stones are being put on our roads? Is it not apparent that the stones are of much larger size than formerly, that they are badly broken, and have undergone no screening of any kind? While this may be due in a measure to the want of labour at the quarries, do not the urgent demands made by surveyors for "any kind of stone to save the roads if it can be sent at once" make it impossible to deliver a better broken or selected metal?

* * * *

Are not local authorities placed under considerable difficulties just now by the demand of the Local Government Board for full particulars as to what money they are likely to require for works of improvement, &c., after the war, when so many of the local officials have joined the Forces, and there is no one left who can prepare the necessary information? Is it not rather premature to ask for information as to how it is proposed to cook the hare before it has been caught? Will there not be required also a prolonged breathing space after this terrible war is over before talking of the expenditure of more money?

Cultivation of Lands Order, 1916.

By REGINALD BROWN, Surveyor to the Southall-Norwood Urban District Council.

(Continued from last week.)

The [illegible] notice of entry would not be given to all who [illegible] occupied land is a very good one. It is within the experience that certain landowners do [illegible] will not, if they can help it, permit their land to be taken under the Order, and it is possible that such notice would result in an intimation being received that the land proposed to be taken had recently been let, although strict secrecy on the point had resulted in the omission of the land from the letting list.

It is interesting to observe that the Regulations define "occupied" land as having occupation which renders it liable to payment of poor rates. There is no definition of "unoccupied" land, but one would assume that if no poor rates are paid, then the land must be considered as unoccupied. But the writer does not think this is so. The Order distinctly states, "liable to payment of poor rates," and by this term covers cases of land which to all intents and purposes is building land, and hence not used, but which is still liable to be rated, because it carries with it beneficial occupation in a greater or lesser degree. Thus building land might be, occasionally, let for grazing purposes, it might be used as a temporary storage ground, and hence would be liable to rates, but the overseers of the parish have not brought it into rating because they were not in possession of the land of occupation. Still, the land is liable to be rated, so that one wants to be very careful in assuming land is unoccupied simply because it appears to be so, or because it is not on the rate-books.

It is [illegible] and plotted out and let to cultivators on very [illegible] that all one's labour has been in vain. The author's practice has been to search the rate-books first, and if there is any doubt of any particular piece of land, he has immediately communicated with the owner stating his intention to [illegible] under the provisions of the Order, and if it is proved to him that the land is actually let, and the date of letting given, the information is conveyed to the rating authorities to bring the land into rating.

The land to be taken is, as stated previously, divided into two heads—(1) Unoccupied lands, for which no rent need be paid, and notice of entry need only be given after entry, and (2) occupied lands by consent of the occupier and the person in receipt of the rent of the land. In this latter case the council would of course be expected to pay a rent for the land, but such rent is limited to the rent payable by the present occupier for the land, or, if held with other land, then only to a fair proportion of the total rent paid; but when the owner is occupier no rent shall be paid by the council is not to be in excess of the annual value for the purposes of [illegible] plus the [illegible] charge (if any).

Previous to the Order coming into operation the [illegible] sent a letter to a large number of [illegible] owners of "unoccupied" land, asking them to offer voluntarily any land to his council for the purpose of war allotments, such offer to state the area and position of the land and the [illegible] it would be let, although he expressed a hope that owners of such lands would make no charge for the use of the land for war allotments. The result of this voluntary appeal was disappointing—very disappointing; only three came forward, [illegible] arrangements, and steps were taken immediately to let this land, subject to the following conditions:—

SOUTHALL-NORWOOD URBAN DISTRICT COUNCIL.

Particulars of Plots of Land Loaned to the Council by Owners during the Period of the War.

(1) The allotments to be called the Council War Allotments.

(2) The rent to be [illegible] plots, unless otherwise agreed upon by the Council.

(3) As the owners have granted over the land free of rent and rates, the Council are not [illegible] to the tenants by the Council except by [illegible] of rates and taxes to be assessed on the land. This will amount to 5d. for each [illegible] plot, [illegible] to be paid when signing the agreement to take the land, and in the event of the land being [illegible] the same [illegible] one year a similar sum is to be paid to the owner on the 25th day of March in each year, or on [illegible] as may be decided upon, of which the [illegible] will be given. The amount paid on entry will cover the tenancy as endorsed on the receipt given for the amount paid.

(4) The owners of the land hand the same over to the Council in its present condition, without fences in the majority of cases, and subject to resumption by them after receipt of two months' notice. The plots are therefore let to tenants on similar conditions. They must quite understand that the land will *not* be fenced by the Council, and that any fences required by them must be put at their own expense, and, further, that the tenancy must be given up on the receipt of two months' notice (less one day), without any claim whatever on the part of the holder. This latter is the essence of the letting.

(5) The Council, by their Surveyor, reserves power to enter and inspect the allotments at any time.

(6) Each holder shall properly manure, manage, and cultivate his allotment in accordance with good husbandry, and maintain and at the termination of his tenancy leave the said allotment in good heart and condition.

(7) Each allotment holder must preserve his allotment boundaries, and keep the paths between same and the surroundings free from heaps of stones, rubbish, and other incumbrances.

(8) Allotment holders must not erect any building or erection, or fence of any kind, on the said allotments without the previous consent of the Council.

(9) Allotment holders must not assign any allotment or any part thereof without the consent of the Council being first obtained, and if an allotment holder leaves the district, the allotment held by him will be considered vacant, unless such allotment has been transferred as above mentioned.

(10) Allotment holders desiring to vacate tenancy are expected to give at least one month's notice to the undersigned. Failing receipt of such notice, or the notice of termination referred to in Clause 1, being given, the liability for rates and taxes or other charges for the ensuing year will remain with the registered holder of the plot.

(11) Notwithstanding anything contained in Clause 4, should notice of termination of tenancy be given to the holder during the time growing crops are on the land, such holder shall be entitled to receive compensation for such crops to such an amount as may be settled by the undersigned.

By order of the Council,
R. BROWN, M.INST.C.E.,
Engineer and Surveyor to the Council.

These are given here because they formed a basis—as will be seen hereafter for lettings under the Order.

Before, however, the arrangements and lettings were completed the Order came into force, which put a new complexion on the matter, and that which could not be obtained voluntarily could, for the first time, be obtained compulsorily. The author's council then passed the resolution authorising him to act on behalf of the council in everything pertaining to the Order. His first step then was to select suitable land in various parts of the district and issue the notice given below:—

SOUTHALL-NORWOOD URBAN DISTRICT COUNCIL.

THE CULTIVATION OF LANDS ORDER, 1916.

Under the Defence of the Realm (Consolidation) Regulations, 1914, the Board of Agriculture and Fisheries are empowered to exercise certain powers with a view to maintain the Food supply of the Country, and to authorise Local Authorities to exercise those powers on behalf of the Board.

And whereas the Board have authorised the Urban District Council of Southall-Norwood to exercise on behalf of the Board the powers conferred upon them by Regulation 2 L of the Defence of the Realm (Consolidation) Regulations, 1914, *inter alia*, "to enter on any land without any consent if the land is for the time being unoccupied, or was unoccupied on the 29th day of November, Nineteen hundred and sixteen."

Now under the Regulations above referred to, and with the authority of the said Urban District Council, I hereby give notice that certain unoccupied lands in various parts of the district are to be taken over, a list of which may be seen at my Office.

Applications may be made on forms to be obtained at my Office, and the Regulations governing the cultivation may be inspected at the same address.

REGINALD BROWN, M.INST.C.E., ETC.,
Engineer and Surveyor to the Council.

Town Hall, Southall
15th December, 1916.

The principal object of the Scheme is to stimulate the growth of substantial Foodstuffs, such as Potatoes, and the cordial cooperation of all those who desire to increase our Food production is invited. It is hoped that men and women of all classes will come forward and give all the time and labour they can spare, so as to secure that every available acre shall be making its contribution to our home-grown supplies of Food.

This not only entailed labour in selecting the land, but also in staking out the plots and preparing fresh regulation and application or agreement forms. In order to curtail labour as much as possible, tracings were made from the Ordnance maps of the various lands taken, and the area divided into plots and numbered. A number of hectographed copies of the plan were struck off equal to the number of plots

contained in each area, and one of these was kept for "letting" purposes, each plot being "ticked" off as they were let, so that the mistake of letting the same plot twice over could not occur. Many of the lettings took place even before the plots were staked out, and each cultivator on signing the agreement had handed to him a copy of the plan with his plot marked in red so that he could easily identify it on the ground. This arrangement saved an immense amount of labour, as the "stakes" were not numbered. In addition to this the author has not found it necessary to do more, in the majority of cases, than place the "stakes" at the back of the path, or along the front of the plot, the small plans handed to the cultivator being quite sufficient to show him the depth of his plot. The chief object of the Order is to get as much land under cultivation as quickly as possible, and as the charge made for each plot was very small one could not afford to spend more time than absolutely necessary on the work of staking out, even if the staff was available —which it was not. The author has, during the whole of the lettings, made it a rule that he would, personally, see each cultivator—and he has let as many as sixty plots in one morning. The Order necessitated slightly different regulations than those previously given, and for comparison therewith are given below:—

THE SOUTHALL-NORWOOD URBAN DISTRICT COUNCIL.

THE CULTIVATION OF LANDS ORDER, 1916.

Regulations as to Taking Unoccupied Lands by Cultivators.

(1) The plots to be 10-pole plots, unless otherwise agreed upon by the Council.

(2) As no rent is being paid by the Council to the owners for the use of the land, no rent as rent—will be charged to the cultivators, but, as far as practicable, the payments to be made to the Council by the cultivators for the use of the land shall cover the cost incurred by the Council in providing the land or adapting it for cultivation.

(3) Notice of determination of arrangement to cultivate may be given at any time, but compensation shall not be paid to the cultivators (1) in excess of the value at the time of quitting of the crops growing on the land, and the labour expended upon and manure applied to the land since the taking of the last crop in anticipation of a future crop; or (2) if the determination takes effect on or after the 1st January, 1918. Any compensation payable under this clause shall be subject to the provisions of the Order.

(4) The land shall not be used for the production of vegetable crops which continue productive for more than one year, or for grazing, or for such crops as rhubarb or asparagus, the principal object of the scheme being to stimulate the growth of substantial foodstuffs such as potatoes.

(5) The Council may, if they think fit, fence in the land, but as the cost of such fencing would obviously be unprofitable for land held for a short and uncertain period, the responsibility of protecting the plots from trespass or pilfering is placed on the cultivators themselves. Should, however, fences be provided, the cost of same will have to be paid, in advance, by the cultivators. It is impossible to state definitely what the cost of the fencing would be, as each piece of ground requires different treatment.

(6) The Order in Council under which the land is taken has effect only during the War, but under the Defence of the Realm (Acquisition of Land) Bill, it is proposed that the Board of Agriculture and Fisheries shall have power to extend the period of occupation under the Regulations for such a period as may be necessary for securing any annual crop growing at the end of the War. Cultivators cannot therefore count with certainty on more than one year's crops from the land.

(7) The Council, by their Surveyor, reserves power to enter and inspect the land at any time.

(8) Each cultivator shall properly cultivate the land allotted to him, or he will be required to vacate same, and it will be handed over to another cultivator.

(9) Each cultivator must preserve his boundaries and keep the surroundings free from heaps of stones, rubbish, and other incumbrances.

(10) Cultivators must not erect any building, or erection, or fences of any kind, on the land without the previous consent of the Council being obtained in writing.

(11) Notices will be posted on the land by the Council asking the public not to trespass on or damage the plots.

(12) The Council has power to purchase seed, manures, or implements required for the cultivation of the land, and sell the seed and manures to the cultivators, or allow the use of the implements for a consideration.

(13) A list of the available lands may be seen at my Office.

(14) Applications are invited from persons desirous of cultivating land, purchasing seed, manures, &c. Forms of application may be obtained on application at my Office.

(15) Although, as pointed out in Regulation 2, cultivators will be called upon to repay to the Council expenses incurred, it is not anticipated that more than 6d. per annum will be called for as the proportion of rates and taxes for each 10-pole plot, but this does not include any expenses for special works which may be required in adapting the land for cultivation or for fencing.

By Order of the Council.

It will be noticed that a nominal sum of 6d. only is charged for each 10-pole plot—probably the lowest charge in the country. In fixing the charge the author had in mind that the Order required the payments to be made by cultivators should cover the cost to the council, but seeing that the council were not paying rent for the land, the only expense which could be incurred was the cost of "staking" out. Sixpence may appear low even for this, but the author is satisfied that the small charge has had a good deal to do with the success of the movement; in fact, he felt that it was the duty of the local authority—in a case of this sort—not to make any charge even for "staking" out, but to make the nominal charge of 6d. to cover any rates which might be allocated against the land—which, by the way, is not claimed, so that, although the "rent" is small, it is, in the author's opinion, sufficient.

Of course this—as the regulations point out—does not provide for fencing; indeed, the circular accompanying the Order anticipated that, in the majority of cases, fences would not be required. The Order also provides that certain works of adaptation might be necessary, and that these should be paid for by the cultivators. What is meant by "works of adaptation" the author cannot guess, unless it is draining or other similar special works, or possibly laying on water to the land; but as neither of these works is required on the lands let by the author, the costs of such do not enter into consideration. While it may be necessary to charge a higher price in some districts, the author can never see why it should reach a charge of 9s. for a 10-pole plot, as in cases he has heard of. A charge such as this is just the thing to stultify the objects of the Order. If the rent includes the cost of fencing, then, as different lands require different treatment, so far as fencing is concerned, it is the author's opinion better to let each parcel of land bear its own share of fencing if fencing be required. Again, it may not be the desire of all allotment holders to go to the expense of fencing in the land as the tenancy is so short, and to get over this difficulty the author has been prepared to carry out an arrangement as follows: The cultivators of a particular area *all* to agree to have the land fenced in, and to pay the cost of fixing the fence together with 10 per cent of the capital cost for each year, or part of a year, the land is retained by them, the cultivators to have the right of purchasing the fence if they so desire from the council, but if not, then the fence to remain the property of the council, and to be removable by them. Such an arrangement may not, of course, suit every district, but it is one which assists cultivators without being a serious burden on the general ratepayer. After all, the production of food in large quantities is the principal aim, and anything which a council can do to assist cultivators they ought to be ready to do.

(To be continued.)

DUTY OF LOCAL AUTHORITIES.

In the House of Commons Mr. Mackinder asked the Secretary to the Local Government Board if his attention had been called to the action of certain local authorities in Scotland in temporarily releasing their employees who had experience in ploughing, and whether he would urge upon all municipalities the importance of taking similar action without delay wherever possible.

Mr. Hayes-Fisher said the action taken by local authorities in Scotland had been reported in the Press, and he hoped their example would be followed here, and that the further publicity given to the subject would influence local authorities in England and Wales to do all in their power in this and other ways to help the national effort for the increased production of food.

ELECTRICITY SUPPLY.

APPOINTMENT OF DEPARTMENTAL COMMITTEE.

It is announced that the President of the Board of Trade proposes to appoint a departmental committee to report what steps should be taken, whether by legislation or otherwise, to ensure that there shall be an adequate and economical supply of electric power for all classes of consumers in the United Kingdom, particularly industries which depend upon a cheap supply of power for their proper development.

Scarborough Corporation and National Service.—At a recent meeting of the Scarborough Town Council in committee, the position of corporation employees under the National Service scheme was considered. The question arose in respect to two employees who had enrolled for service and had been accepted. In one case it was too late for the corporation to appeal. In the other it was decided to appeal against the man being called up. A sub-committee was appointed to consider the matter.

CORRESPONDENCE.

Πας ἀνηρ οὐ πανθ' ὁρᾶ

One man does not see everything.)
—Euripides.

JUNIOR INSTITUTION OF ENGINEERS AND ENGINEERING STUDENTS.

To the Editor of The Surveyor.

Sir,—The Council of the Junior Institution of Engineers, at the meeting held on January 25, 1917, passed a resolution having reference to extending the advantages of membership to apprentices at approved works, and students of such technical schools and colleges as may be approved by the council from time to time. This approval would be determined by the curriculum which is existent, or may be adopted in these schools and colleges. Broadly speaking, the proposal is that such students would be admitted at a reduced subscription, be permitted to attend all meetings and visits, and, by means of the existing J.I.E. "Engineers Register," would be assisted in obtaining employment in engineering works when their course of technical study has been sufficiently advanced.

Almost every engineering student, when at an age necessitating the commencement of a career, has realised how difficult a matter it is to "get a start." Every technical master has had occasion to note that many young fellows who had seemed likely to become particularly capable engineers have, through inability to find suitable openings, drifted into careers in which their technical knowledge has been almost entirely wasted. Every engineering works manager will realise when needing a keen junior assistant the advantage of being able to obtain, through this Institution, one who, in addition to college or other training, has been brought into direct touch with the practical and commercial aspects of engineering problems, through discussions with experienced seniors and visits to important works.

It is the desire of the Council of the Junior Institution of Engineers to meet these separate needs, and to accept "student members," as they may be called.

A committee has been appointed to prepare the preliminary details of such a scheme for further consideration. The members of this committee are:—

Mr. F. D. Napier, A.M.I.E.E., chairman, J.I.E.

Mr. R. Rankin, B.SC., A.R.T.C., M.I.E.E., vice-chairman, J.I.E.

Mr. C. H. Woodfield, M.I.MECH.E., vice-chairman, J.I.E.

Mr. B. E. Dunbar Kilburn, M.A. (CAMB.), A.INST.C.E., past chairman, J.I.E.

Mr. T. A. Walsh, [illegible] ASSOC.M.INST.C.E., M.C.I., member of council J.I.E.

Mr. W. A. Tookey, M.I.MECH.E., M.I.A.E., past chairman and secretary J.I.E.

The qualifications of these gentlemen are such as to ensure that the requirements of all branches of engineering will be fully understood, and the purpose of the present letter is to invite the goodwill of employers and of the principals and professors of schools [illegible] to the project.

The activities of the institution—by juniors for juniors—are already well appreciated, and the spirit of comradeship existing in its ranks has become proverbial throughout the engineering profession.

No other institution, even in its "student" or "associate" section, offers quite the same advantages [illegible] Informal discussions upon engineering [illegible] take place in the J.I.E. Institution [illegible] every Friday evening, from October to May inclusive.

Papers—some of the utmost interest and importance—presented by specialists are read and discussed monthly in London, Manchester, Sheffield, Birmingham; and each month, even under the present [illegible] conditions, a visit is paid to [illegible] centres of engineering interest. In this way students at recognised engineering schools and colleges, and apprentices in engineering works obtain a grip of the essentials of their future work, which only alone can never give, and if the scheme thus discussed is well supported, the new developments cannot fail to advance the interests of students, technical schools, the industry of engineering, and indeed, the nation itself.

Before proceeding to consider and discuss the matter the committee are anxious to obtain, more particularly from principals and professors of technical schools and from works managers, promises of support and co-operation. Communications are therefore invited in order that the committee, when considering further details of the scheme, may be guided by the experience of others to whom the project is of interest, either directly or indirectly.—Yours, &c.,

W. A. Tookey, Secretary.

39, Victoria-street, S.W.

THE CIVIC SURVEY OF S.E. LANCASHIRE.

To the Editor of The Surveyor.

Sir,—There is no need for me to reply at length to your contributor. I must confess that I am satisfied with the results of my two letters. It is always useful to be able to unmask the motives of an opponent. My first elucidated the fact that a few contemptuous phrases concealed an active hostility; my second one has been successful in showing that the ground of this hostility was prejudice. It was, after all, the old quarrel of the surveyors and the architects.

The writer bitterly resented the fact that architects, as well as surveyors, who were working on the civic survey had poached on the preserves of roads. I think your readers would take a wider view, and would bear in mind that a civic survey must deal with the preserves of the engineer, the surveyor, the architect, and the medical officer of health. Each of these might be up in arms on the score of interference, but I think you will agree that it would be difficult to find either a director or workers who combined in their persons such a versatility of professions. I am happy, however, to be able to inform you that on our Advisory Committee, appointed before any work was done, we had the President of the local branch of the Surveyors' Institution, the president of the Manchester Society of Architects, and two members of the Institution of Civil Engineers; while our chairman was not a technician, but a Lancashire business man. We thought that this combination of professional men working with business men would deal with the different aspects practically.

I should also like to correct one false impression that your correspondent's letter may have given—that the survey is concerned with the laying out and making of roads. None of the architects or surveyors working on the survey have had anything to do with such work while they have been engaged on the survey. This would be interfering with the work of the local authorities.

I am sorry to have occupied so much of your time, but I feel it has been much better to ventilate and discuss openly these criticisms against the civic survey rather than to allow them to circulate underground without a chance of refutation.—Yours, &c.,

Patrick Abercrombie.

Liverpool,
March 21, 1917.

CONVERSION OF REFUSE INTO FUEL.

To the Editor of The Surveyor.

Sir,—In your issue of the 16th inst. I note a reference to questions asked and answers given in regard to the above in the House of Commons. As these questions were prompted by me, and as the answers given are far from satisfactory, and are not in accordance with facts, I am taking steps to proceed with further questions to—if possible—obtain the truth.

No matter what the subject-matter might be, putting the above out of consideration, we must have truth and be quite open. The answers reported as having been given are, however, just what one expects from the permanent officials of Government Departments. I shall one day publish the whole facts as between myself and Government Departments.—Yours, &c.,

Reginald Brown, M.INST.C.E., M.I.MECH.E.

Town Hall,
Southall, Middlesex.
March 17, 1917.

SCAVENGING.

To the Editor of The Surveyor.

Sir,—On p. 281 of your issue of March 16th I note that the Grimsby Sanitary Committee hold that scavenging is work for old men. If this refers to street scavenging, I agree, but if it refers to house scavenging, I do not agree. Each of my house scavengers moves 1 ton of refuse per day, which has to be lifted shoulder high and tipped into the van. Some of the lifts are heavy, and it is not old men's work.—Yours, &c.,

F. Hall Smith,
Engineer and Surveyor.

Sheringham,
March 19, 1917.

SCOTTISH NOTES.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Scottish Notes," 24 Bride-lane, Fleet-street, E.C. 4.]

Meeting of Scottish Surveyors.

The Scottish Branch of the Institution of Municipal and County Engineers held their annual business meeting in Glasgow on the 14th inst. Mr. Jas. Lea, burgh surveyor, Paisley—the Scottish vice-president—occupied the chair. The meeting, considering the restricted travelling facilities, was large and representative.

* * * *

Experimental Roads Report.

The chief interest of the meeting seemed to centre round the doings of the Road Committee. The writer some weeks ago referred in this column to the report on the experimental roads which have been laid down in several districts throughout Scotland. That a popular demand was then voiced was evinced by the strong remarks made at the meeting. The action of the Roads Committee in allowing the matter to drift into the hands of a single individual was deprecated, and the expression of opinion showed that the members are anxious to receive the report, and look to the committee to take immediate action. That the report is overdue is not questioned, but the times are not opportune. Several members of the committee are either with the Army abroad or are engaged on war work at home. The statistics, however, are available, and with the promised assistance of the energetic secretary of the branch, much valuable information should, ere long, reach the members.

* * * *

Roads and Labour Conditions.

Some weeks ago the writer had an opportunity of visiting several of the larger burghs and county areas in Central Scotland, and of noting the condition of the roads and inquiring as to labour conditions. In several districts the roads are no worse than was to be expected at the end of a severe winter, while in others the conditions left a great deal to be desired. The latter was the case in the vicinity of naval and military establishments, as also in areas where there had been a considerable amount of tree felling. One surveyor was bitter in his complaints regarding the heavy damage done by motor-'bus traffic, while another attributed the bad state of one stretch of his roads to traffic entirely resulting from war conditions. Questioned regarding female labour, all seemed anxious to secure women workers to take the place of men called up. One had a good squad, who showed themselves very capable on road repair work, and another spoke highly of their efficiency as scavengers—one had even been introduced as a carter. In another district it was explained that the services of women could not be obtained owing to the nature of the local industry.

* * * *

Pooling Labour.

A suggestion has been put forward that surveyors in given areas should arrange to pool their labour, and thus be in a position to concentrate the whole of the available men on the most important or urgent work in the burghs interested. Such a scheme offers possibilities of meeting the present emergency, and if taken up with enthusiasm and properly organised would be fraught with advantages to the places participating. In connection with the National Service movement, the system of pooling might with advantage be extended to masters as well as men. Meanwhile, there are many surveyors who, as a result of the Local Government Board's recommendation to cut down expenditure, find themselves with little to do—that is, little beyond the ordinary administrative work of their department; these men are fit and willing to undertake work of national importance. Could it not be arranged to group three or four burghs, leaving one surveyor to attend to the municipal work of the whole and freeing the others to serve their country in spheres of greater activity and usefulness? The writer is aware that several surveyors have already volunteered for National Service, but what will be the attitude of their several councils should they be called up? Such a scheme as indicated would help to make their way plain. The secretary of the Scottish branch of the Institution of Municipal and County Engineers—who has already done valuable work recruiting for the Road Service and Quarry Companies—could no doubt formulate a scheme acceptable alike to the Government and municipal authorities. It may be of interest to mention that such an arrangement has been in operation in Arbroath and Montrose for over a year; Mr. Brown, of Arbroath, is serving as a Lieutenant with the Royal Engineers in France, while Mr. Christie, of Montrose, is successfully attending to the work in both burghs.

* * * *

The Late Mr. Macmillan, Clydebank.

The sympathy of all Scottish surveyors will be extended to the widow and other relatives of Mr. R. Spiers Macmillan, whose death took place last week under tragic circumstances. Mr. Macmillan, who was assistant burgh surveyor of Clydebank, was thrown from his cycle in front of a tramway car and badly hurt about the head. Although everything possible was done, he passed away in the Western Infirmary, Glasgow, two days later. Clydebank has lost a capable official, and the profession one who gave promise of making his mark as a municipal engineer.

SANITARY SERVICE AND PUBLIC HEALTH.

BRADFORD COMMITTEES' ACTION.

Bradford Cleansing and Team Labour Committee have presented a resolution to the effect that, having regard to the growing accumulations of house refuse in the vicinity of dwelling-houses, due to the shortage of labour in the cleansing department, any future depletion of the staff of workmen engaged in the collection and disposal of house refuse is not in the public interest, but fraught with serious danger to the public health. The committee ask that the Local Government Board shall be requested to insist upon the inclusion of workmen engaged in this service amongst the reserved occupations which are in the national interest, and to afford such other protection as will enable local authorities to maintain this sanitary service at a standard of reasonable safety and efficiency.

On the same subject the Health Committee have passed a resolution in which, while recognising the labour and transport difficulties of the present time, they draw the attention of the Cleansing Committee to the fact that "with the approach of the summer season the likelihood of outbreaks of infectious disease will be greatly increased if accumulations of ashpit refuse are allowed to remain uncollected," and the Cleansing Committee are accordingly urged to use every endeavour to maintain an efficient collection of ashpit refuse throughout the city.

"THE SURVEYOR."

Mr. Charles B. Reid has been appointed to succeed the late Mr. Gibson Thompson as editor of this journal. Mr. Reid has been a member of the literary staff of The Surveyor for nearly twenty-one years, and has had a large share in the development of the paper. He became assistant editor in 1909, and filled that position until the early part of 1914, when he assumed the duties of acting-editor. From its inception The Surveyor has devoted itself solely to the interests of municipal engineers and municipal engineering, and it only remains to add that its policy and aims will continue unaltered.

The Military and Road Repairs.—"The military are bad to deal with; they just do as they like," declared Mr. W. Mack, at Saturday's meeting of the Richmond, Yorks, Rural District Council, with reference to a request from the town council for the improvement of a portion of the highway between the town and Hipswell. The surveyor, Mr. Hodgson, said water collected on a portion of the road, and it would cost £50 to drain and stone it. The work had been rendered necessary by alterations in another part of the road made by the military authorities. It was decided to request the town council to suggest that the military authorities make the improvements asked for.

Municipal Work In Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Loughborough T.C. The borough electrical engineer has received instructions to consult the borough surveyor with respect to the proposed building alterations at the electricity works, for which a loan has been sanctioned by the Local Government Board.

HOUSING AND TOWN PLANNING.

Barnsley T.C. The borough surveyor, Mr. J. H. Taylor, has received instructions to prepare plans of possible sites for working houses, and the town clerk to prepare a report as to the powers of the council under any proposed housing scheme.

Bristol T.C. The city council have confirmed the recommendation of the Health Committee to purchase after the war 500 houses which the Ministry of Munitions proposes to build at Avonmouth.

Huddersfield T.C.—In the course of the discussion of the estimates on Wednesday, Alderman Woodhead pointed out that, although new workshops were being built there were very few new houses. The town could not long endure the overcrowding caused by the influx of workmen and their families or the evils which overcrowding if long continued always created. He felt that those who placed new factories within the borough recently ought to erect workmen's dwellings at the earliest possible date. The council were unable to provide anything like the number of houses required.

Kilwinning T.C.—The town council have decided to communicate with the Ministry of Munitions and the Local Government Board, and invite an inspector to visit the burgh and see the position they were in with regard to housing accommodation.

MOTOR TRANSPORT.

Folkestone T.C.—Three new steam tractors are to be purchased at an estimated cost of £2,500.

Forfarshire C.C.—The road surveyor to the Arbroath District Committee, Mr. Hunter, having suggested that the committee could effect a considerable saving by adopting steam haulage, he has been asked to prepare a report on the subject.

Newmarket U.D.C.—The council are making inquiries of the Surbiton Urban District Council with regard to the cost, method of payment, and usefulness of battery tractors.

Portsmouth T.C.—It has been decided to purchase a new fire engine at a cost of £872.

Salford T.C.—The Gas Committee have decided to purchase from Messrs. Alley & Mac Lellan, of Shrewsbury, a three-ton tipping Sentinel steam wagon, complete with automatic tipping gear and rubber tyres.

Thornaby T.C.—The borough surveyor, Mr. C. T. Johnson, has received instructions to make inquiries as to the cost of a motor fire engine.

REFUSE COLLECTION AND DISPOSAL.

Bolsover U.D.C. The question of undertaking scavenging and sweeping by direct labour is being considered by the council.

Chatham T.C. The town council decided recently that the money received from the sale of the waste paper collected in the borough should be devoted to the Mayor's Fund for the Prisoners of War in Germany, after the payment of expenses. The mayor thanked the council, and spoke of the arrangements that had been made by the borough surveyor (Mr. C. Dray) for a systematic collection of waste paper and the disposal of it. He anticipated a handsome addition to the fund at the end of six months. It was decided to adopt a resolution forwarded by the Sheffield Trades Council requesting that the Local Government Board should insist upon the inclusion of workmen engaged in the removal of house refuse among the essential occupations in the national interest, owing to the depletion of staff and the growing accumulation of refuse. The residents are to be asked to burn as much refuse as possible.

Folkestone T.C.—In view of the expected saving from the use of steam motors the town council have reduced the estimate of £4,000 for the collection of house refuse to £3,600.

Lewisham B.C.—As a result of a letter received from Major Manners Howe, who was formerly adjutant of the Lewisham National Reserve, the council have initiated a scheme for the collection of fat, grease, and bones from households in the borough. In his letter the major states that grease is now of vital importance, and he urges the council to start a systematic crusade for its collection, as well as for the collection of bones, cooked and uncooked. The matter has been referred to a committee to draw up a scheme, but meanwhile dustmen have been authorised by the council to receive the waste fat from the inhabitants.

ROADS AND MATERIALS.

Aylesbury T.C.—The surveyor, Mr. W. H. Taylor, has been instructed to report on the cost of laying wood blocks in Market-square, in front of the town hall.

Exeter T.C.—It was reported that it was proposed to expend £500 in tar-spraying, as against £250 last year. It was pointed out that the increased cost, owing to war conditions, was nearly double. The chairman of the Streets Committee stated that the committee had at various times considered the advisability of doing this work by council workmen, but at present they had neither the labour nor the plant to do it. The committee had a scheme in view for procuring further plant and a depôt, but they did not feel justified in asking the council to grant the necessary money to carry it out just now. The city council approved a motion instructing the committee to consider the matter of tar-spraying by direct labour in time for next year.

Folkestone T.C.—The estimate of £400 for watering the streets has been reduced to £200.

Newport (Mon.) T.C.—It has been decided to proceed with the necessary work recommended in connection with the improvement proposals at Riverside, and to defer the larger works till after the war.

Poplar B.C.—According to a report of the Works Committee creosoted deal paving, by reason of its resiliency, withstands the wear-and-tear of heavy motor cars better than granite setts. In the widened part of East India Dock-road, granite sett paving, laid to the specification of the chief engineer of the London County Council, is wearing badly through the excessive heavy traffic, whereas the wood paving laid at the same time on the north side of the road is withstanding the traffic much better.

Richmond (Surrey) T.C.—An offer of land by the Whitehead Company, Limited, for the widening of part of Sheen-road has been referred to the Highways and Finance Committee for consideration and report.

West Riding C.C.—At the quarterly meeting held recently, Alderman P. R. Jackson regretted the withdrawal of the labour of prisoners of war, and announced that in addition to the motor tractors now at work in the Riding they would have fourteen more before long. Mr. W. W. Slingsby said he trusted another attempt would be made to induce the Government to alter their decision with regard to the employment of prisoners of war.

SEWERAGE AND SEWAGE DISPOSAL.

Bedford T.C.—The Sewerage Committee advise the carrying out of certain works in connection with the main drainage scheme at the site of the proposed new buildings at the electricity station, at an estimated cost of £900.

Chatham T.C. — The Local Government Board informed the council recently that they had considered the report of their inspector on the inquiry with reference to the sewage scheme, and they pointed out certain amendments which they considered requisite. These amendments, it appeared, had been anticipated by the

engineer, and it was decided to send the amended plans to the board.

Creasbrough U.D.C. Improvements and extensions of the sewage disposal system at Mangham and Greenside have been sanctioned by the council.

WATER, GAS, AND ELECTRICITY.

Carmarthen R.D.C.—Complaints were made of the shortage of water in the Gorslas district, and it was alleged that the Llandilo Rural District Council had failed to carry out their agreement to supply 50,000 gallons per day. It was stated that the water had been taken by the collieries. The council decided to make representations to the Llandilo Council on the subject.

Dublin T.C. In consequence of the destruction of the premises of many of its best customers during the rebellion, the corporation electricity undertaking suffered a nett loss of £7,200.

Epsom U.D.C.—The council are considering a proposal to construct a main for a water supply at Langley Bottom, at an estimated cost of £740.

Exeter T.C.—The city council have adopted a recommendation of the Electricity Committee that the salaries of members of the electrical engineer's staff be raised as follows, and that the committee be empowered to graduate the scale as they may deem expedient—chief assistant, maximum be raised from £180 to £200; station superintendent, £165-£185; chief clerk, £160-£180.

Middleton T.C.—The electrical engineer, reporting on the proposal to link up the electricity undertaking with the electricity station at Manchester, states that the scheme will involve a considerable reduction of the present plant. It has been decided to send the report to the Local Government Board.

Scunthorpe U.D.C.—It has been agreed to obtain two new settings of retorts for the gasworks, and to adjourn the question of purifiers for the present.

Sheffield T.C. The Watch Committee "because of the new circumstances reported," has authorised the chief constable to have lighted ninety additional street lamps, and that all lamps lighted be kept burning till a later hour than at present.

Swansea R.D.C.—Steps are to be taken to stop a large number of leakages in the Penellangaer service pipes, which are stated to entail a loss of £3,000 a year. It was reported that there was plenty of water in the reservoir, but a lack of pressure to carry the water to Penellangaer.

MISCELLANEOUS.

Blackpool T.C.—There is now every probability that the Improvement Bill before Parliament will go through as an unopposed measure. Terms are being arranged with the landowners for the extension of the promenade for a mile southwards. Expenditure estimated at about £250,000 sterling will be commenced immediately after the war is ended.

Halesworth U.D.C.—A letter was read from the Local Government Board in respect to the appointment of Mrs. Flaxman as deputy sanitary inspector of nuisances during her husband's absence on military service. The clerk was instructed to reply that the council was satisfied that Mrs. Flaxman is able to perform the duties, and that the clerk and medical officer of health had promised assistance if required.

Horncastle R.D.C.—The surveyor, Mr. H. Costar, stated at the last meeting that all roadmen had applied for an increase of wages so as to put them on a level with farm workers. It was resolved that wages be increased at the discretion of the surveyor, but that no man be paid more than 4s. per day, also that the men be required to work the same number of hours per week as farm hands.

Sudbury T.C. It was reported that a Suffolk gelding had been purchased for council work for £96.

The War and Road Repairs.—At the Horsham Tribunal on Tuesday application was made for further exemption of the only man left to the Surrey County Council capable of looking after steam-rolling tackle. The man was forty years of age, married, and passed for B1. The county surveyor, Mr. A. Dryland, who supported the application, said sixteen men had already been sent, and the lack of labour was having serious effects upon the roads. Exemption was granted for three months.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATIONS FOR LOANS.

Barnsley T.C.—£4,000 for electricity purposes.

Rotherham T.C.—£400,000 for the erection and equipment of a new electricity power station.

LOANS SANCTIONED.

Bedford T.C.—£32,703 for electricity extensions.

Loughborough T.C.—£19,925 for electricity plant, £5,000 for structural alterations, and £1,275 for cables.

FORTHCOMING INQUIRY.

MARCH.	£
27.—**Burnley.** For the provision of a hospital (Mr. P. M. Crosthwaite)	13,600

TAR SPRAYING.

COUNTY COUNCILS' CONTRIBUTIONS.

In the course of the last meeting of Devon County Council, Mr. F. W. Hunt (Barnstaple) asked whether the Road Committee would not consider the desirability of defraying the whole cost of tar-spraying, instead of charging half the cost to the districts. He submitted that as the committee paid for the cost of the upkeep of the roads, and tar-spraying added to the life of a road, it was reasonable that they should pay the whole charge of tar-spraying.

Mr. Hurrell said in a good many instances the tar was used for laying the dust.

Mr. H. Barrett thought the refusal of the committee to pay the whole cost was a penny-wise-and-pound-foolish policy. It was done in Somerset and some other counties. He moved that the committee be asked to consider the propriety of defraying the whole cost of spraying.

Mr. W. Vicary considered it would be unfair to make the whole county pay if they did not spray the rural roads as well as those in urban areas.

Mr. Wilton considered this was not the time to adopt such a proposal. They should move in the line of economy.

The proposal was defeated.

Rubber Stamps.—There are many grades of rubber stamps, and, despite keen competition, it is desirable to purchase in a trustworthy market. A maker we can strongly recommend is Mr. S. Berkley, of 8, Livery-street, Birmingham, and if any further testimony be necessary as to the sterling value of the goods he produces this is abundantly forthcoming in the fact that he has been supplying the public for nearly forty years, and at remarkably reasonable prices too, when the high quality of his goods is taken into consideration. As an instance we may mention that a combination pencil or knife and stamp is to be had with one line of lettering for the small sum of 10d., with two lines for 1s. 6d., or with four for 2s., and a self-inker, with similar numbers of lines, for 2s., 2s. 6d., and 3s. respectively. Mr. Berkley undertakes the manufacture of all kinds of rubber stamps, including those for dating and numbering in great variety, facsimile signatures, and other specialities, and those of our readers who are not acquainted with his goods are strongly recommended to obtain his price-list, which can be had free on application.

FOR OTHER ADVERTISEMENTS
See End of Paper.

CIVIL ENGINEER, B.Sc., desires employment under a Municipal Engineer, an Engineering Firm, or on Contract Works. Experience of buildings, waterworks, and railways. References given. Box 1,695, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. 4. (3,367)

ELLAND URBAN DISTRICT COUNCIL. The Elland Urban District Council require the temporary services of a fully qualified Surveyor conversant with the work of town planning schemes. Applicants not to be eligible for military service.

Applications to be made to James Clarkson, clerk, Council Offices, Elland, stating age, salary required, with two references, not later than April 8th. (3,368)

PERSONAL.

Mr. G. Drewett, borough surveyor of Calne, has resigned after forty years' service.

Mr. James D. Lamb, Markinch, has been appointed manager to the Markinch municipal gasworks.

Mr. F. Grove, assistant county surveyor of Surrey, is serving as Second Lieutenant in one of the road construction companies in France.

Mr. J. A. Prestige and Mr. S. Oliver, road surveyors to the Newton Abbot Rural District Council, have been granted a war bonus of £10 each.

Mr. L. Pye, surveyor and resident engineer to the sewerage scheme of the Cleethorpes Urban District Council, has been voted a war bonus of £25 per annum.

Mr. F. Idiens, highway surveyor to the Stafford Rural District Council, is serving in the Forces, and the council have agreed to make him an allowance of £40 per annum.

Mr. E. J. Goodacre, assistant to the borough surveyor of Shrewsbury, has received a commission as technical officer to labour units attached to the Liverpool Regiment.

Mr. D. T. G. Brown, surveyor to the Sherborne Urban District Council, has obtained a commission in the Devon Regiment, and the council have agreed to pay him half salary during his absence.

Mr. A. H. Claypoole, Assoc.M.Inst.C.E., divisional engineer, city engineer's office, Bristol, has received a commission as a technical officer, and will be attached for duty to the Devonshire Regiment.

Mr. P. H. Palmer, the president-elect of the Institution of Municipal and County Engineers, will be glad to receive offers to read papers at the forthcoming annual meeting of that body at Hastings.

Mr. G. F. Hazell, surveyor and inspector of nuisances to the Sherborne Rural District Council, has received a commission in the Royal Engineers. He will receive an allowance from the council of half his salary.

Ventnor Urban District Council at their last meeting decided to place a tablet in the council chamber to the memory of the late Lieutenant Tozer, who had occupied the position of town clerk for eight years previous to the outbreak of war.

Mr. E. S. Haslett, who was appointed temporary surveyor to the Camborne, Cornwall, Urban District Council, in case Mr. C. D. Bell were called up, has found himself unable to accept the position owing to pressure of work, and the council have decided to advertise the post.

Mr. Frank Latham, borough surveyor of Penzance, has been granted an allowance at the rate of £150 a year while his military rank remains Second Lieutenant, subject to revision at any time; and Mr. Henry Maddern has been appointed temporary borough surveyor at a salary of £150 per annum.

Mr. J. H. Halstead, surveyor to the Knaresborough Rural District Council for the past fourteen years, has accepted a commission as Technical Officer to Regimental Labour Units, and is attached for duty to the Durham Light Infantry. Mr. Halstead has been chairman for several years of the West Riding of Yorkshire Highway Surveyors' Association.

Mr. G. H. Hamby, borough surveyor of Lowestoft, has resigned. In a letter to the town council he states that the strain and anxiety of the work was more than he could bear. He thanked the council for past kindnesses and the help he had always received during his long term of service, now nearly thirty-one years. The letter has been referred to the town council in committee for consideration.

Mr. Archibald Page, assistant electrical engineer to the corporation of Glasgow, having been appointed assistant general manager of the Clyde Valley Electrical Power Company, the Electricity Committee recommend that Mr. R. B. Mitchell, superintendent of street mains, be appointed to the vacant position at a salary of £600 a year, rising by annual increments of £30 to a maximum of £800, and that Mr. G. L. Black, district mains superintendent, be appointed (in Mr. Mitchell's room) superintendent at a salary of £300 per annum, rising by annual increments of £25 to £500.

OBITUARY.

We regret to announce the death of Mr. C. H. Bradshaw, divisional surveyor for the North-Eastern Division of the County of Middlesex, which took place suddenly on Monday, the 12th inst., at his home at Palmers Green, N. Mr. Bradshaw had acted as divisional surveyor (under Mr. H. T. Wakelam, county engineer) for the past thirteen years, previous to which he was on Mr. Wakelam's office staff for about four years. The deceased was much respected by his chief, his colleagues, and all who were brought into contact with him. His charm of manner and straightforwardness endeared him to everyone. Mr. Bradshaw died at the early age of forty, and leaves a widow and three children to "mourn one of the best."

Mr. Wakelam has also just lost the services of Mr. J. Williams, his chief accountant, who died, after a short illness, on the 3rd instant at his house at Osterley. Mr. Williams was well known to all the local authorities and their officials throughout the county of Middlesex, and enjoyed the greatest respect and esteem of both his chief and the office staff. He served for fifteen years in the position he occupied, and was a most devoted and painstaking officer. His genial presence and personality will be greatly missed by all who knew him. He died at the early age of forty-five, and leaves a widow and five children.

Death of Mr. Baldwin Latham.

We deeply regret to announce the death, which took place on the 13th inst., at his residence, Park Hill House, Croydon, of Mr. Baldwin Latham, one of the best-known engineers of his day. Mr. Latham was a recognised authority on matters connected with sewerage and water supply, and public authorities formed a considerable proportion of those who sought his advice. He was born eighty-one years ago at Nantwich, Cheshire, and was the son of Mr. George Latham, an architect of some repute. He received his education at Nantwich Grammar School and Tattenhall College. From 1858 to 1863 he was surveyor to the city of Ely, and afterwards became surveyor to the Croydon Local Board, a position which he filled until 1872. In 1868 he commenced practice in Westminster as a civil engineer, and with his sons continued in active work practically up to the time of his death. Mr. Latham was a member of the Institution of Civil Engineers and of the Institution of Mechanical Engineers, and a Fellow of the Royal Meteorological Society—of which he was twice president—the Geological Society, and the Surveyors' Institution.

The Late Mr. Gibson Thompson.

Mr. Prescott Row writes: "As an old friend of Gibson Thompson, more closely associated with him twenty years ago than in recent times, I am glad to add my tribute to his memory. He was a man of gracious personality and charming manners. When I first met him in 1892 he had not long been back from Portugal, and was a working journalist in London. He was then full of his idea of starting The Surveyor, and many an hour we spent in his old rooms in Rupert-street in talking over the project and its possibilities. The paper made its first appearance on January 21, 1892, and I have a vivid recollection of sitting in a large, bare office late into the night, busily packing the first number into wrappers for the post, while Thompson in the corner of the room steadily and gravely wrote the copy for number two. Some twelve months later he snatched a short holiday, and we walked together over Exmoor and through North Devon. He was at his best that year—keen, bright, gay, a delightful companion, enjoying to the full the air, the exercise, and the amusing chances of our footpath way. The ten days we were together will always remain a pleasant memory. A few years afterwards we spent a summer in a little upland town in Kent. Close by was the village of Westerham, the birthplace of General Wolfe. Thompson soon became very interested in the associations of the neighbourhood, and the result was the writing of 'Wolfe Land,' a handbook to the district that remains a model of sound work and a valuable contribution to the topography of Kent."

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 21 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

WALSALL CORPORATION ELECTRICITY UNDERTAKING.

NEW POWER STATION AT BIRCHILLS.

A paper entitled "The New Electric Power Station at Birchills, Walsall," was read by Mr. Ernest Matthew Lacey, M.INST.C.E., at a meeting of the Institution of Civil Engineers, held on Tuesday last.

The early history of the electricity undertaking of the Walsall Corporation and the original system of generation and transmission were briefly described; also the steps taken by the corporation since the year 1913 to provide for an efficient supply of electricity in the Walsall area.

The conditions determining the size and site of the new power-station were stated, and the question of possible land subsidence owing to old colliery workings was dealt with.

Reference was made to the controversies regarding the economy which arises in the production and distribution of electricity by the concentration of plant in power-stations of large capacity, and the author expressed his views as to the ultimate limit beyond which no appreciable advantages would accrue by reason of such concentration.

It is claimed that the Walsall power-station is by far the lowest in cost per kilowatt of any yet erected in this country, due to special features in the design and type of plant installed, these special features consisting more particularly in the arrangement of the coal-handling and boiler-house plant.

The general arrangement of the coal-handling plant was fully described, the main object in the design being to obtain adequate coal-storage and at the same time to save the heavy expenditure on constructional work necessary to provide for overhead coal-storage bunkers of large capacity.

The boiler-house was designed for six self-contained units, each unit consisting of a water-tube boiler with integral superheater, a superimposed economiser, ejector induced draught plant, a steel "Venturi" type chimney, and a mechanical chain-grate stoker. Each unit was designed for a high duty evaporation of 30,000 lb. of steam per hour from water entering the economiser at a temperature of 100 degrees Fahr. In an appendix particulars were given of the normal and high duty tests of a boiler unit of the type adopted, the results showing an overall efficiency of over 88 per cent based on the nett calorific value of the coal.

It was claimed that the Walsall power-station was one of the first examples erected in this country for the accommodation of the special type of boiler unit described, and the more important features and advantages of the design were referred to.

A high concentration of steam-raising plant in modern power-houses was advocated, and the important bearing which it had upon the general and structural design of modern power-houses and its advantages were fully dealt with, as was also the design of boiler necessary to obtain such high concentration.

The engine-house was designed to accommodate three 4,000-kilowatt turbine-driven alternators, of which two have been erected. The turbines are of the compound horizontal impulse type, and work with steam at a pressure of 180 lb. per square inch and a temperature ranging from saturation to 620 deg. Fahr. at the stop-valve, the normal speed being 3,000 revolutions per minute. The construction of the turbines was described, and attention was drawn to special features, more particularly to the provision of directing boxes for the control of the various oil and water pumps which, although the rule for marine work, have been but little used on land.

The condensers are of the surface type, with rotary kinetic air-pumps and centrifugal water-circulating pumps driven by electric motors. The arrangement was fully described, as also were the various appliances for measuring and recording the steam-consumption of the turbines.

The alternators are of the revolving-field type and generate three-phase alternating current at a pressure of 6,600 volts between phases, with a frequency of 50 cycles per minute, the full-load output of each alternator being 5,000 kilo-volt-amperes. The more important features in the construction of the alternators were described, as also was the system of ventilation which has been applied, and which it is claimed has special advantages.

The extra-high-tension switchgear was fully described, and the special features in its design and construction were referred to.

COST.

The actual cost of the works under the various contracts was set forth, the figures showing that the cost of a 12,000-kilowatt station of the design described, at 1914 prices, is approximately £5 3s. per kilo-volt-ampere of plant installed, or £6 12s. per kilowatt ($\cos \varphi = 0{\cdot}8$).

It is claimed that the economy of the Walsall design represents not less than 30 to 40 per cent., and that not only has this economy been obtained without any sacrifice of efficiency for the sake of cheapness, but that this type of station is in fact far more economical in operation than stations of more usual design.

The cost of producing electricity at a station of this type was fully dealt with, and curves showing these costs and the effect of the load-factor thereon have been prepared. An appendix showed in detail the total annual cost of production and costs per kilowatt-hour sent out with a station load-factor of 30 per cent.

The system of transmission and distribution to consumers was briefly referred to.

CONTRACTORS' WAR-TIME DIFFICULTIES.

THE FUTURE OF THE ROADS.

At the seventh ordinary general meeting of William Griffiths & Co., Limited, the well-known contractors for municipal and public works, the chairman, Mr. Ralph H. Burdett, dealing with the past year's trading, recalled that at the previous meeting he told the shareholders that, owing to the Local Government Board having refused to sanction any expenditure by municipal authorities on roads, the prospect of their receiving orders for paving work was very remote, and, as a matter of fact, this had proved to be the case. No such expenditure had been allowed, and therefore the very considerable portion of the company's business which they termed paving and constructional work had been of a very small amount, and owing to the shortage of men it had been carried out under ever-increasing difficulties. On the other hand, the demand for stone from their quarries had been far greater than the diminished number of their workmen had admitted of their supplying. The balance-sheet, however, showed that the business they had been able to carry out had earned the company a fair profit. Shareholders could hardly conceive the difficulties they had had to encounter owing to shortage of men, lack of railway trucks, shipping—in fact, transport of every description—and he was afraid there was no probability of any improvement taking place before the conclusion of the war. He was glad to say that during the four months that had passed since the end of their last financial year the business had been maintained. It was impossible, however, to tell what larger number of men the Government might require, and so it was impossible for him to make any forecast of the immediate future; but, as he told the shareholders last year, owing to scarcity of men and material, the roads of this country were everywhere getting into such a deplorable condition that he very much doubted if, at the conclusion of the war, they would be able fully to cope with the orders which must be placed. In conclusion, he stated that the company had executed a considerable number of orders for the War Office and Admiralty, including large shipments of granite from their Guernsey quarries for making up roads in France behind the British Army.

Upkeep of Railway Bridges Carrying Highways.—At their last meeting the executive council of the County Councils Association referred to the Parliamentary and Highways Committee a resolution received from the Somerset County Council, requesting the association to confer with the Association of Municipal Corporations and the Urban and Rural District Councils Associations, in order to obtain a change in the law whereby the decision of the House of Lords in the recent case of the Attorney-General (on the relation of Pickford's, Limited) *v.* Great Northern Railway Company may be reversed, and the same responsibility may be placed on railway companies, in respect of bridges carrying highways over their railways, as if they were road authorities.

AN IMPORTANT ECONOMY IN FUEL.

(From a Correspondent.)

Many coal economy attempts have been made from time to time to purchase briquettes out of slack and coal-dust, with varying degrees of success. All these attempts have been in the direction of forming the blocks or briquettes under pressure, which involves the erection of special plant and the provision of considerable capital. But lately successful experiments have been made in other directions, which make it possible for anyone to manufacture coal-dust briquettes, without any plant, and with only a capital of a few shillings.

The householder is always grumbling about the amount of coal-dust in his coal-cellar, and the difficulty with his servants when they are told to use it on the kitchen fire—all this can now be altered if the following instructions are carried out:

PLANT AND MATERIALS REQUIRED.

A few 4-in. to 5-in. flower-pots, a pestle, or small rammer, a small table, or a flat board, about a quarter of a bushel of Portland cement and the coal-dust out of your cellar.

METHOD OF CONSTRUCTION OF BRIQUETTES.

Mix a bucket of coal-dust—say three gallons—with 1 1-5 pints of Portland cement (*i.e.*, one of Portland cement to 20 pints of coal-dust) and thoroughly blend them together by turning over and over in a dry state. If more cement than the above quantity is added the briquettes will not burn properly, and if less, then it will not set properly. Then add gently and slowly about 2½ pints of water, and again thoroughly mix, taking care not to make the mixture too wet (the "dough" thus formed should just hold together when squeezed in the hand). Then place the mixture in the flower-pots and press and ram it into place. It can be turned out at once by inverting the box on to a flat board, and should then be placed in a dry, cool place for five or six days, when it can be handled, and is quite ready to burn on a fire like an ordinary lump of coal.

COST OF THE BRIQUETTES.

This, of course, depends on the price of coal and of the cement, but as the dust is really not only valueless, but a nuisance to get rid of, it is only necessary to purchase the cement. If Portland cement is costing, say, £2 a ton, the outlay for cement to deal with a ton of coal-dust would be only 2s.

The briquettes thus made have all the appearance of those made under high pressure, and can be burned in exactly the same way. The discoverer of this process did not patent the process, or endeavour to make any money out of it, but he is very anxious that the general public should be able in this way to save their coal at this great crisis in our history, and has given his invention freely *pro bono publico*. Experiments are now being conducted to see if special briquettes of this construction can be made with anthracite for steam boilers, and if these are successful, they should prove a great boon to industry.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. James S. Brodie, M.Inst.C.E., Borough Engineer and Surveyor, Blackpool.

EASTERN DISTRICT.

A meeting of the Eastern District of the Institution of Municipal and County Engineers will be held at [illegible] on Saturday, the 31st inst.

NORTH-EASTERN DISTRICT.

A North-Eastern District meeting of the Institution of Municipal and County Engineers will be held at [illegible] on Saturday, March 31st.

PROGRAMME.

2.30 p.m. Meet at the offices of The Spenborough District Council, Town Hall, Cleckheaton, when the members will be welcomed by Councillor J. H. Collier, J.P. (chairman of the Council).

Paper entitled "A Few Notes on the Duties of a Surveyor," by Mr. A. Rothera (member), surveyor to the Spenborough District Council.

Business:

To report receipt of letter from Mr. O. Claude Robson, in reference to the Orphan Fund and the action of the Executive Committee thereon.

To consider the election of district representatives on the council, district chairman and district secretary for the ensuing year.

To make arrangements for future meetings.

5 p.m. Tea at the town hall after the meeting, by the kind invitation of the chairman of the council (Councillor Collier, J.P.).

W. E. H. Burton, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Wakefield.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Edward Whitwell, F.I.S.E., M.S.A., Engineer and Surveyor, Abersychan Urban District Council.

EASTERN AND NORTH-EASTERN DISTRICTS.

An Eastern and North-Eastern District meeting of the Institution of Municipal Engineers will be held at Peterborough on Wednesday, April 18th.

PROGRAMME.

12 noon. Meet at City of Peterborough Electricity Generating Station, and inspect works, by kind permission of the engineer.

1 p.m. Adjourn for lunch.

2 p.m. Visit to Messrs. Barford & Perkins, Limited, Engineering Works, by kind permission of Mr. J. G. Barford.

Visit to City Museum if time allows.

4 p.m. District meeting at Swiss Café, Narrow-street, when a paper, "Experiences in a Fen Rural District," will be read by Mr. A. W. Broker, district chairman.

Tea.

G. Belson Chilvers,
Hon. District Secretary.

Oundle, Northants.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue. ***but those responsible for their despatch are recommended to arrange that they shall reach*** **The Surveyor** ***office by noon on*** **Wednesdays** ***to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.***

ASSISTANT INSPECTOR OF NUISANCES.—March 26th.—Bootle Town Council. £100 per annum.—The Town Clerk, Town Hall.

ENGINEER AND SURVEYOR.—March 28th.—Blyth Urban District Council. £300 per annum.—Messrs. R. T. and T. R. Guthrie, clerks, 34 Bridge-street, Blyth, Northumberland.

FIRE BRIGADE SUPERINTENDENT. March 28th.—Corporation of Leigh, Lancs. £120, with free house, coal, light, and uniform.—Mr. W. H. Cowburn, town clerk, Town Hall, Leigh, Lancs.

MAINS SUPERINTENDENT.—March 28th.—Neath Rural District Council.—Mr. C. H. Thomson, electrical engineer and manager, 8 New-street, Neath.

SURVEYOR. March 29th.—Camborne (Cornwall) Urban District Council. £120 a year.—Mr. C. V. Thomas, clerk, 3 Chapel-street, Camborne.

DIVISIONAL SURVEYOR.—April 7th.—Middlesex County Council. £300—£350.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster, S.W.

BOROUGH ENGINEER'S CLERK.—April 8th.—Borough of Royal Leamington Spa. £2 per week.—Mr. John J. Kennan, borough engineer, Town Hall, Leamington Spa.

MUNICIPAL ENGINEER. May 1st. Municipality of Lahore, India. £1,000—£1,600 per annum. Mr. H. P. Tollinton, deputy commissioner and president, Municipal Committee, Lahore.

ROLLER DRIVER.—Ripon Rural District Council. 36s. per week.—Mr. J. W. Plewes, 6 Firs-avenue, Ripon, Yorks.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

PEMBROKE.—March 29th.—For alterations and additions to a school-house, for the County Education Authority.—Clerk of Works, County Education Offices, Haverfordwest, Pembrokeshire.

HEYWOOD.—March 31st.—For an extension of the outfall house at Botany, for the corporation.—Messrs. J. Diggle & Son, civil engineers, Hind Hill-street, Heywood.

CORK.—April 2nd.—For the erection of a school.—Ballingeary R.I.C. Barrack, and the District Office of Works, Cork.

DEWSBURY.—April 2nd.—For the construction of water-closets or outbuildings, for the corporation.—The Borough Surveyor, Town Hall.

Engineering: Iron and Steel.

WIGAN.—March 31st.—The Education Committee offer for sale a second-hand corrugated iron and timber school, in excellent condition.—Mr. A. T. Gooseman, borough engineer and surveyor, King-street, Wigan.

HORNSEY.—April 2nd.—For the supply of new sectional cast-iron heating boilers, with piping, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor, Town Hall, Highgate.

MANCHESTER.—April 3rd.—For the supply of a turbo-alternator and condensing plant, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall.

WARRINGTON.—April 11th.—For the supply of one 3,000-k.w. turbo-alternator, and surface condensing plant, for the corporation.—Mr. F. V. L. Mathias, borough electrical and tramways engineer, Howley, Warrington.

ST. PANCRAS.—April 12th.—For the supply of lamp carbons, for the borough council.—The Electricity Department, 57 Pratt-street, Camden Town, N.W.

GREATER WINNIPEG.—April 12th.—For the supply of 12,000 ft. of 48-in. and 1,300 ft. of 60-in. cast-iron pipes, with specials, for the commissioner.—Mr. R. D. Waugh, chairman, 501 Tribune-buildings, Winnipeg, Man., Canada.

TEWKESBURY.—April 14th.—For the supply of a small portable baling press, with wheels, for baling waste paper, for the corporation.—Borough Surveyor, Station-street, Tewkesbury.

ABERDARE.—For the supply of a battery of accumulators, for the urban district council.—The General Manager, Electricity Department.

Roads.

HAMPTON WICK.—March 24th.—For the supply of granite chippings, shingle, and distilled tar, for the urban district council.—The Acting Surveyor, Council Offices, Hampton Wick.

WREXHAM.—March 26th.—For the supply of road-stone, for the rural district council.—Mr. G. V. Price, interim clerk, Council Offices, Midland Chambers, High-street, Wrexham.

COCKERMOUTH.—March 26th.—For the repair of highways, for the rural district council.—Mr. J. B. Wilson, Grecian Villa, Cockermouth.

DOCKING.—March 26th.—For the supply of materials and team labour, for the rural district council.—Mr. W. W. Hopking, Great Bircham, Docking, Norfolk.

HAZEL GROVE.—March 27th.—For the supply of broken stone, setts, kerbs, chippings, ashes, pipes, and other materials, for the urban district council.—Mr. G. S. Doncaster, surveyor, Council Offices, Hazel Grove, near Stockport.

ROAD MAKING.

REINFORCE CONCRETE ROADS WITH
EXPANDED METAL.

EXMOUTH SEA DEFENCE WORKS. Expanded Steel-Concrete Slope and Roadway. Length 1 mile, total width of Roadway, 45 feet. Mr. SAMUEL HUTTON, Urban District Council Engineer and Surveyor

THE EXPANDED METAL COMPANY, LIMITED
(Patentees and Manufacturers of Expanded Metal).
Head Office: YORK MANSION, YORK STREET, WESTMINSTER, LONDON, S.W.
Works: STRANTON WORKS, WEST HARTLEPOOL.

WEST ASHFORD.—March 27th. For the supply of 1,100 tons of granite, for the rural district council.—Mr. Alfred Sage, surveyor, 3 Queen-street, Ashford, Kent.

CAERPHILLY.—March 27th. For the supply of macadam metalling, for the urban district council.—The Surveyor, Council Offices, Cardiff-road, Caerphilly.

MALLING.—March 27th.—For the supply of flints, kentish rag, quartzite, basalt or granite, tarred macadam, tar, gravel, lenham stone, hoggin and sand, stone pitching, stone labour, and workmen's tools, for the rural district council.—Mr. W. Marshall, acting highway surveyor, Springetts Hill, East Malling.

LOUGHTON.—March 27th. For the supply of 500 tons of granite, 300 yds. of gravel, 200 yds. of hoggin, 150 tons of granite chippings, and hire of steam roller, for the urban district council.—Mr. H. White, surveyor, Loughton, Essex.

GRETTON.—March 27th.—For the supply of 950 tons of lodden XX XXX granite and screenings, for the rural district council.—Mr. F. Oakley, clerk, Uppingham.

ELHAM.—March 28th. For the supply of Guernsey, Jersey, Leicester, Warwick, Penlee and Quenast granites and basalt, for the rural district council.—H. Jones, Surveyor, Lyminge, Kent.

CRANBROOK.—March 28th. For the supply of 1,200 yds. of unbroken Kent ragstone, 80 yds. of rag ragstone, and 100 yds. of ragstone chippings, for the rural district council.—Mr. S. F. Williams, acting clerk, Council Offices, Cranbrook, Kent.

SHARDLOW.—March 28th.—For the supply of slag-macadam, Leicestershire granite, ironstone slag, limestone, kerbing, paving setts, and sanitary pipes, for the rural district council.—Mr. J. S. Wooddisse, surveyor, Aston-on-Trent, Derby.

RUGBY.—March 28th. For the supply of about 100 tons of refined tar, for the urban district council.—Mr. J. H. Sharp, surveyor, Benn Buildings, Rugby.

CANNOCK.—March 30th.—For the supply of granite, furnace slag, tarred furnace slag, kerbs, setts, stoneware pipes and gullies, for the urban district council.—Mr. R. Blanchard, engineer and surveyor, Council Offices, Cannock.

WORTLEY.—March 31st. For the supply of road material and carting, for the rural district council.—Mr. F. A. S. Crawshaw, surveyor, 17 Haymarket Chambers, Sheffield.

BULKINGTON.—March 31st.—For the supply of broken granite, and for haulage, for the urban district council.—Mr. C. Blakeway, clerk, 2 Church-street, Nuneaton.

SELBY.—March 31st. For the supply of materials and for the repair of the roads, for the rural district council.—Mr. J. Townend, clerk, Council Offices, 1 Abbey-place, Selby.

BILLERICAY.—April 2nd. For the supply of granite, Kentish rag, Kentish flints, gravel, screenings and sand, carting and hire of horse and man, for the rural district council.—Mr. F. E. Ennals, Shelley-road, Hutton, and Mr. R. J. W. Layland, Billericay.

MELTON MOWBRAY.—April 2nd.—For asphalting and repairing footpaths, for the rural district council.—Mr. G. E. Fryer, surveyor, Wyndham-avenue, Melton Mowbray.

ALDERSHOT.—April 3rd. For the supply of 410 tons of slag tarmac, 1,000 tons of 2½-in. Devon or Welsh basalt, and 14,000 gallons of dehydrated tar, for the urban district council.—Mr. F. C. Uren, surveyor, Municipal Buildings, Aldershot.

LONDON.—April 3rd.—For the supply of granite setts for tramway purposes, for the county council.—General Manager, L.C.C. Tramways, 62 Finsbury-pavement, E.C.

CUDWORTH.—April 3rd. For the supply of tarred slag, for the urban district council.—Mr. W. T. Lyham, surveyor, Council Offices, Cudworth, near Barnsley.

WHITSTABLE.—April 7th.—For the supply of hoggin, flints, and ballast, for the urban district council.—The Surveyor, 33 Oxford-street, Whitstable.

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NOTE.—Copies of this paper may be purchased by local authorities, to assist them in the discharge of their duties, and charged to local funds.

The Surveyor

And Municipal and County Engineer.

Vol. LI. MARCH 30, 1917. No. 1,315.

Minutes of Proceedings.

The Resewering of Private Streets.

When a sewer constructed by a landowner in a private street has got into a bad state of repair, questions of some difficulty may arise as to the incidence of the expense of its repair or reconstruction. With regard to private street works, other than sewering, it has been held that, under sec. 150 of the Public Health Act, 1875, whenever the urban authority is reasonably dissatisfied with the condition of a street the frontagers can be charged with the expense of such works, even although the street may have been made up at their expense on a previous occasion (*Barry and Cadoxton Local Board* v. *Parry*, 59 J.P., 421). And looking at that section by itself it might be concluded that sewering stands upon the same footing as other works. But there are other provisions in the Act, dealing especially with sewers, which preclude such a conclusion. Sec. 13 provides that all existing and future sewers within the district of a local authority (with certain exceptions which will rarely apply to street sewers) shall vest in and be under the control of the local authority; and sec. 15 provides that every local authority shall keep in repair all sewers belonging to them. How are these provisions to be reconciled with those contained in sec. 150? The question first came before the courts in the leading case of *Bonella* v. *Twickenham Local Board*, 52 J.P., 356). In that case a sewer had been laid in a private street by a land company in 1868, before the constitution of the board, and in 1884 the board, in order to adapt the sewerage of the street to their general system, called upon the frontagers to resewer. But it was held by the Court of Appeal that the frontagers could not be compelled to do so. In the course of his judgment Lord Esher said: "The moment this sewer vested in the board it became their duty to see that it was sufficient for the requirements of the street and the inhabitants of the street, and if the board were not satisfied with the sewer they might, at that time, have exercised the powers given them by sec. 150 of the Public Health Act, 1875. They must, of course, be allowed a reasonable time to make up their minds whether the sewer was sufficient; but if they did nothing, or expressed no view on the subject within that reasonable time, it must, having regard to the circumstances and the provisions of the Act of Parliament, be taken as conclusive that they were satisfied with the sewer. Now it appears to me that if the board were once satisfied with the sewer they could not afterwards take proceedings under sec. 150. The powers which are given by that section as to sewers must be exercised once for all, and must be exercised at the time when it is open to the urban authority to declare that the street is not sewered to their satisfaction."

The principles thus laid down have been recognised and accepted in subsequent cases. In the application of those principles, however, of course, the actual facts and circumstances of the particular case come into play. In the Twickenham case the magistrates had found, as a fact, that the street had been sufficiently sewered by the land company originally; and it was held that the sewer was not made for the profit of the company, but vested in the board. In a subsequent case, two roads were laid out and sewered by a land company in 1867 and 1868, but according to the evidence they were neither properly formed nor properly sewered. After laying out the roads the company sold the adjoining land in building plots, on which houses were erected, the drains from which were connected with the sewers laid by the company. The board was constituted in 1873, and in 1881, both the roads and the sewers being in bad repair, they called upon the frontagers to resewer. In these circumstances it was held that, having regard to the character of the district, the nature of the ground, and the time and work that were necessary for properly sewering the roads, there had been no unreasonable delay on the part of the board, and that they never were satisfied, but had reasonable grounds for being dissatisfied, with the sewers; and that the frontagers were chargeable (*Walthamstow Local Board* v. *Staines*, 7 T.L.R., 446). And in another case several combined drains had been laid in a street, by various owners, for draining several groups of houses, such drains being connected with a main sewer in another road; and it was held that, although a considerable time had elapsed since the street was laid out, having regard to all the circumstances, and to the fact that the street was in the meantime growing, the local authority were entitled to charge the frontagers with the cost of resewering (*Handsworth Urban District Council* v. *Derrington*, 61 J.P., 518). Without wearying our readers by multiplying references, it may be stated as a general rule that, in the absence of special circumstances, when a long period of years has elapsed since the laying of a sewer in a street, a presumption will arise that the authority accepted it as a sewer laid to their satisfaction; and unless that presumption can be rebutted, the frontagers cannot be charged with the cost of resewering.

* * *

The Danger from Darkness.

At the Leeds Assizes last week there was tried before Mr. Justice Rowlatt and a jury a case which raised an important legal question as to the liability of a local authority for injuries caused to a pedestrian by reason of the present darkened state of the streets. The plaintiff, who was a tailor, sued the Sheffield Corporation for

alleged negligence, whereby he lost the sight of one eye in the following circumstances. It appears that on an intensely dark night the plaintiff was feeling his way along an unlit street, when he was struck in the eye by a sharp projection, which proved to be the guard round a tree. For the defendants it was argued that no case could be brought successfully against the corporation for the condition of the street which obtained at the time. In normal times the tree guards were perfectly safe, there being plenty of light to reveal their presence. But the lights were subdued by a special order to meet certain emergencies. For the plaintiff, however, it was suggested that the guard itself constituted a nuisance to the highway, inasmuch as the particular spike projected 6½ in. from the perpendicular, 3 in. more than the proper angle. The height of the guard was only 5 ft. 2½ in., instead of 6 ft. There was no suggestion of contributory negligence, and it was contended that the corporation ought to have taken proper steps to safeguard the public from the danger.

The learned Judge, in the course of his summing up, said that the case raised an interesting point, having regard to the special conditions attached to the question of liability. No person without authority had right to put any obstruction upon a public highway. But the Sheffield Corporation had that authority, in so far as it related to planting trees and erecting guards. They had no fixed kind of guard to put up, but it was left to them to erect any kind compatible with public safety. In normal times there was no question that the guard would not have been visible to pedestrians, who would take care to avoid collision. But the extinguishing of all lights affected the safety of guards, though the liability of the corporation to maintain their safety remained. It could not be said that there were no limits to that liability. But the corporation could be called upon to take "reasonable" precautions. They could not be expected to uproot every tree, or to have all the spikes on each guard straightened out. By "reasonable" steps he meant binding the guards with straw or whitewashing them. His lordship then put two questions for the jury to consider—first, was the guard dangerous under the circumstances of the darkness that existed; and second, ought the defendants, if they exercised foresight and took reasonable measures, to have neutralised the danger before the accident? The jury answered the questions put by his lordship in the affirmative, and awarded plaintiff £660 damages against the corporation.

* * *

Town Planning in India.

In a country like India, which is in a state of gradual transition from mediævalism to modern commercialism, it is evident that a unique opportunity is presented for the practical application of town planning principles. It was therefore very appropriate that the Town Planning Institute should at their last meeting have formally placed on record their appreciation of those engaged in India in this work. The resolution was passed at the conclusion of the discussion on a paper in which Mr. H. V. Lanchester, F.R.I.B.A., gave an account of his work in Southern India. In that part of the country three distinct types of towns are to be found: the Tamil city, in which everything is subordinated to a dominating group of temple buildings; the Telegu city, of which the principal feature is merely the bazaar or main business street; and the Malayani city, found on the south west coast, which, owing to the prolific growth of palm trees, is practically a natural garden city. The chief difficulties in the way of town development on sound lines arise not so much from the want of definite powers—for where these are lacking advantage can be taken of the fact that the people are thoroughly accustomed to municipal control—as from the habits and customs of the natives. For example, overcrowding is not caused by economic necessity, as in this country, but by the social system which requires men of one religion, caste, or trade to live together in a given area, expansion of which is rendered impossible by the proximity of similar areas belonging to another caste. Again, it is customary for property to be gradually subdivided among the members of a family, additional accommodation being gained by back additions, and even by building over the court. The result is that many once convenient houses become divided into a number of inconvenient and unhealthy dwellings. The best remedy for this unsatisfactory state of affairs is by the provision of a counter-attraction in the way of pleasant and convenient houses as near as possible to the congested district. Even if these be built, however, no little difficulty is experienced in overcoming the prejudices of those for whom they are intended. A further difficulty in regard to housing arises from the fact that many even of the poorest of the slum dwellers own their houses, and would not readily pay rent. It is therefore advisable, in rehousing, for the municipality to provide the site, to allow so much of the old buildings as may be portable to be transferred and reused, and then to pay out the amount allowed as compensation in instalments as the new house is erected. In view of the interest of the whole subject for those engaged in town planning work in this country, we publish some full extracts from Mr. Lanchester's paper elsewhere in this issue.

* * *

Officials and Military Service.

The claims of the Army are at the moment so urgent that no decent-minded citizen would desire to withhold a single unnecessary man from service. On the other hand, however, it must be remembered that there are certain classes of skilled work which simply must be carried on unless our home organisation is to break down altogether. Unfortunately, many of the expert and skilled workers in these occupations are at the same time of military age and medically fit for military service. This renders it in many cases extraordinarily difficult, not only for the men themselves, but even for the authorities, to determine how their services can best be utilised in the national interest. Many officers of local authorities are placed in this position, and while in the vast majority of cases fit men who are still left in civil life would vastly prefer to be doing their bit in the fighting line, it is impossible to release them because of the enormous strain that has been put upon our local government organisation by the prevailing war conditions. We observe that a number of cases from various corporation departments were recently before the local tribunal of a South Coast town. The discussion centred principally around certain appeals lodged by the waterworks engineer. These appeals related to seventeen members of his staff, of whom thirteen had been passed as fit for general service. The chairman of the tribunal inquired as to the possibility of getting substitutes, and very naturally commented on the number of men on the list who were in Class A. The reply of the engineer was that the work was of such a nature that able-bodied men were absolutely necessary if the water supply of the town was to be maintained. It is satisfactory to observe that in all but three of the cases four months' exemption was granted.

* * *

Municipal Housing.

The President's Premium of the Institution of Municipal Engineers has been awarded to Mr. John H. Mole, the surveyor to the Chester-le-Street Rural District Council, for the very thoughtful paper on the housing question which he read at the last annual Northern District

meeting of that body. Mr. Mole, while recognising that in its day much good work was accomplished by private enterprise, is an avowed advocate of municipal housing. It is certainly the fact that since the passing into law of the Housing, Town Planning, &c., Act, 1909, the building of cottages by local authorities has received an enormous impetus. Indeed, during the five years 1909 to 1914, schemes were sanctioned by the Local Government Board for the erection of over 6,000 houses, at a cost of upwards of a million and a quarter sterling. To those who are familiar with the very limited activities of local authorities under the old *régime*, these figures will be sufficiently eloquent. Since the advent of war, however, building has almost completely stopped, and there is little doubt that some form of State aid will be necessary if future needs are to be met at all adequately. As Mr. Mole points out, existing insanitary and otherwise defective housing conditions are in a large measure responsible for the cases which go to fill our sanatoriums, infectious diseases hospitals, asylums and union workhouses, establishments which are not only provided but maintained by our rate and tax funds. If this state of affairs can to any appreciable extent be alleviated by the provision of better housing, then State-aided housing reform is deserving of serious consideration. In the latter part of his paper Mr. Mole dealt with such questions as the selection and purchase of the site, the laying out of the land, the planning and erection of the houses, the financing of a scheme, and the subsequent management of the property. He is to be congratulated on his well-deserved award of the President's Premium.

* * *

Reinforced-Concrete Wharves.

In the course of a very interesting paper on the subject of the Rational Design of Reinforced-concrete Wharves and Jetties, which was submitted by Mr. W. Cleaver, M.INST.C.E., at the last meeting of the Concrete Institute, reference was made to two questions which merit more than passing notice. The first was as to the desirability of employing specialists to advise as to the design of such structures. There is some force in the analogy drawn by Mr. Cleaver between the general medical practitioner who consults a specialist in a particular case and the engineer in general practice who takes into consultation an expert in a particular class of work, such as reinforced concrete. But in each case the legitimate function of the specialist must be borne in mind. The responsibility for the general design ought to rest with the engineer, who alone is conversant with all the local conditions and requirements. It is only when this provisional design is complete that the work of the specialist in criticising it and making suggestions begins. In this way the finished design will not only meet local requirements, but will also be in every particular in accordance with the most modern knowledge. The other question to which we refer is that of the amount of concrete cover that ought to be provided in all cases over the steel. There is undoubtedly a tendency to reduce this to an unsafe minimum. In theory, the amount of cover required may be exceedingly small, but it must not be forgotten that the steel reinforcement when put together does not always lie in the strict plane provided by the design. Under the best supervision and workmanship, some sagging or buckling is almost bound to take place, and a fairly generous allowance in concrete covering is therefore highly desirable.

* * *

Municipal Piggeries.

Of the many questions which are being forced to the front by the war conditions at present imposed upon the country, not the least important is that of waste utilisation. In this connection the request of the Government that local authorities should start piggeries in their districts is not without interest. The matter has been taken up with commendable promptitude by the Bognor Urban District Council, who are proposing to keep sixty pigs. These are to be fed and cared for by men at the refuse destructor, who will receive extra remuneration for their services. Mr. Oswald Bridges, the surveyor to the council, points out that by careful arrangement it should be possible to feed the animals without any expense to the ratepayers. There is undoubtedly a large amount of waste food which finds its way into the dustbins of every household, and the suggestion is that this should be placed in separate receptacles, and placed by the dustman in a covered bin in his cart. If a request could be made, either by circular or by personal call, householders would at the present time be very disposed to fall in with the proposal. At all events, Bognor's experiment will be followed with considerable interest. In another column will be found plans of the breeding sties, which are to be built in pairs, while the fattening sties will be in groups of three, with a view to localising any outbreak of disease that may occur. As regards the encouragement of pig-keeping by private individuals, we have already expressed our views as to proposals that have been made for a relaxation of the by-laws. In this connection it is interesting to note that, acting on the advice of their medical officer of health, the Eye Town Council have decided that it is not desirable to waive or relax any of the existing regulations.

* * *

Holywell Urban Council and St. Winifred's Well.

The ethics of entering upon a legal contest over their lost well were thoroughly aired by the ratepayers of Holywell recently at a public meeting held to consider a resolution passed by the urban council to institute proceedings against the Halkyn District Mines Drainage Company. The famous well, which is the source of the water supply of Holywell, and is otherwise an important financial asset to the district, was drained dry early in January, owing, it is alleged, to the operations of the drainage company. One of the speakers, who appeared to be versed in the local circumstances, emphasised the fact that the company had carried out their works within the scope of their Parliamentary powers, and well outside the scope prohibited by their Bill. However this may be, the Holywell Urban District Council have obtained counsel's opinion on the matter, the terms of which they very properly refuse to disclose, though judging by the decision they have reached, it is evident that these furnish them with at least a *primâ facie* case for legal proceedings. Meanwhile it was stated that the drainage company have refused to discuss the matter with the urban district council or to receive a deputation from them. Legal proceedings of the kind contemplated, of course, would be a formidable undertaking for a small urban authority, but there are other interests at stake besides their own, both local and general—it was stated, for example, that the council would have the Roman Catholic community of Great Britain at their backs to see the thing through—and there is said to be no lack of money behind the movement. That there can be any prospect of recovering the well would seem to be remote, if not altogether out of the question, but the points at issue are of more than local importance, and the legal proceedings—if the ballot of the ratepayers follow the same course as the vote of the public meeting—will be watched with interest in many quarters. It is doubtful whether a case so unique in its combination of utilitarian and romantic phases has ever been before the Courts.

Next week's "Surveyor" will be published on Thursday, April 5th, and all news and advertisement matter should therefore reach us not later than Wednesday morning, April 4th.

Municipal Piggeries.

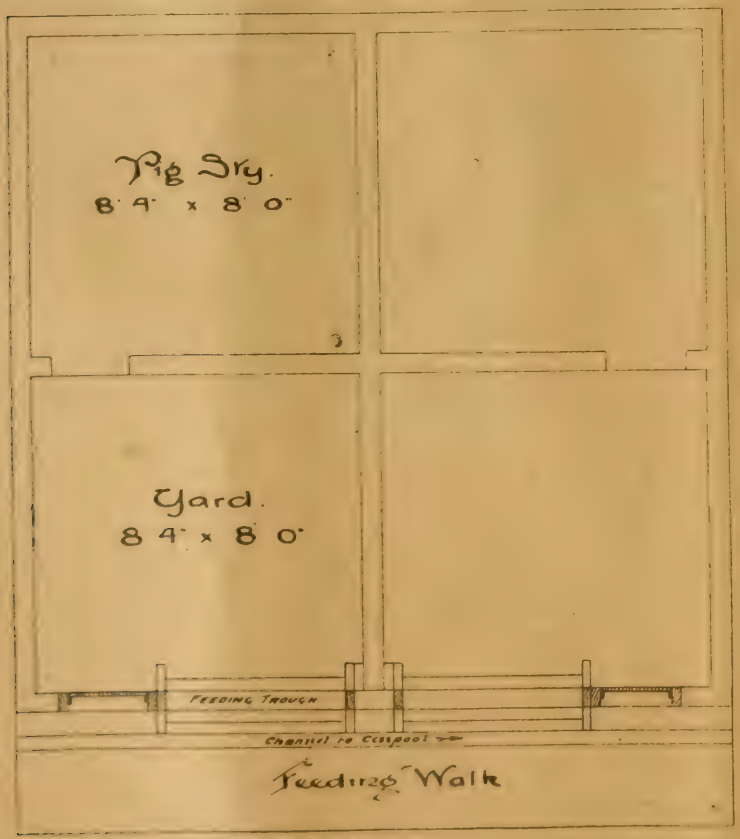
By OSWALD A. BRIDGES, M.E.San.Inst., L.R.I.B.A., Surveyor to the Bognor Urban District Council.

With a view of increasing the food production of the country, all local authorities have been asked by the Government to start piggeries in their districts, and generally to encourage pig-keeping among the cottagers so far as this can be done without creating a nuisance. This is without doubt a very proper course to pursue in these serious days of submarine warfare, when the tonnage of our merchant ships is being sunk by the almost through food and other necessaries.

For years Denmark and Holland have supplied this country with bacon, and have had the market entirely systematised, but while in these countries pig-keeping has been encouraged in every way, in England it has been discouraged by the severity of the by-laws. A pig, if kept in a well-constructed sty and properly attended to, can be made to be as clean as any other animal, and under such conditions diseases such as swine fever would never be heard of.

We have never given pig-keeping a proper trial in this country, it should be a most profitable industry, but it must be dealt with on proper lines. Hitherto, if anyone has started pig-keeping, they have constructed a sty with any old material that could be found, with a floor of bricks laid dry on the bare earth, or some other material laid in a similar way. Or, perhaps, there has been no floor at all, the consequence being that the sty soon became offensive to the neighbourhood, and a nuisance. Pigs, for their health's sake, and for the protection of the public against a nuisance arising, must be housed in properly-constructed sties, and carefully attended to.

Front Elevation.



Plan.

Model Municipal Piggeries. Breeding Pens.
Scale ½ in. = 1 ft.

There are good reasons why local authorities should keep pigs themselves, not only in war time, but afterwards. I have always advocated this. Consider the waste food which finds its way into the dustbins daily from every household. This could be collected without any extra cost, or very little, and profitably utilised in feeding the ratepayers' pigs at the municipal sties. The dustmen should be instructed to call at each house and ask the householder (or this could be done by circular or by a handbill) to store the waste food in a separate receptacle, and it could be collected whenever the dustmen called at the house, and placed in a covered bin or tub in his cart, and taken to the piggeries, which, for the convenience of the men should be on the site of the refuse destructor.

Now is the time to start such an undertaking; the public are fully alive to the urgency of the food question and would be only too glad to assist the local authority by putting aside the waste food, instead of throwing it into the dustbin, and when they have become accustomed to doing this it may reasonably be expected that they will continue the practice after the war.

In future waste materials of every kind will be put to some practical use. Nothing will be thrown away. All waste food must be boiled before being used; the

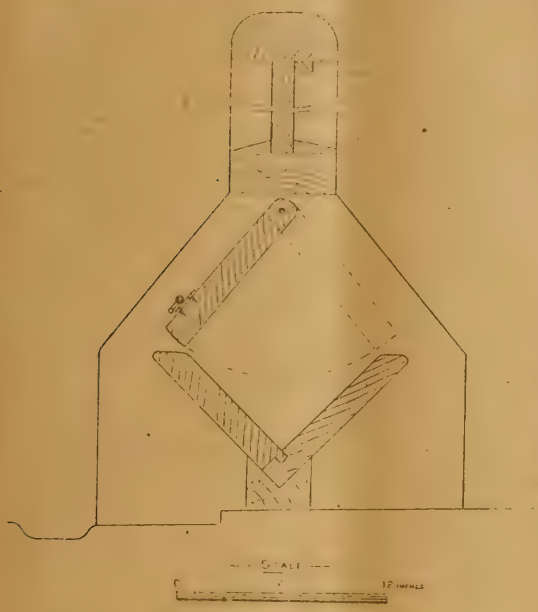
grease that floats to the surface and the bones must be carefully stored away in covered tubs or other receptacles, for ultimate sale to the Government.

The kind of pig or the number to be kept are matters that I cannot advise upon, but there are usually on councils no lack of practical men with the requisite knowledge. I would suggest that two or three breeding sows be purchased, and, if possible, a pig, which would supply in time all the pigs that would be required, and without much cost. The food for sows should not be good—i.e., the waste food collected would almost keep them; they would require very little meal, but pigs for fattening require much more.

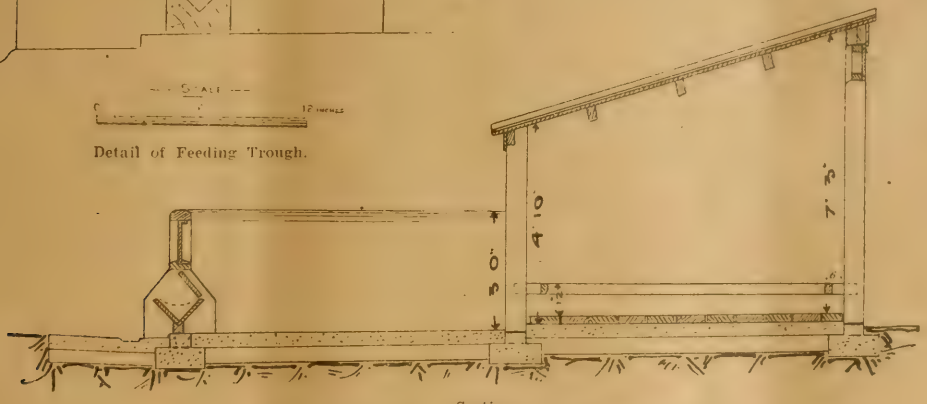
BOGNOR'S STIES.

The Bognor Urban Council have adopted a scheme of pig-keeping. They propose to keep sixty pigs, but have commenced by purchasing two or three sows in pig, which have been selected by an expert pig-keeper in the district. The pigs are to be fed and cared for by men at the refuse destructor, who will receive extra remuneration for their services. The breeding sties, of which plans are given herewith, are built in pairs, and the sties for fattening pigs in threes, the idea being that in case of disease breaking out it may be confined to the sties affected. All pigs should be insured against such diseases. The sties are constructed with breeze blocks 12 in. by 18 in. by 6 in., made out of refuse from the destructor, and cement rendered inside and out. The floor is of cement concrete on 6-in. clinker. The roof is boarded, felted, and covered with galvanised corrugated iron. Each sty is fitted with a crush rail, which should be 12 in. from the floor and 6 in. from the walls, to prevent the little pigs from being crushed to death when the sow lies down. The floor of the sty must be covered with 2-in. boards to prevent the pigs getting rheumatism. Ventilation is provided by a window in the highest part of the building, but this requires to be made use of only in hot summer weather. The feeding trough is so constructed that the pig can be effectually kept away whilst the food is being put in or the trough cleaned out. The floors of the sty, yard, and feeding walk should have a sufficient fall (3 in. in 10 ft.) to the channel which conveys the liquid to a cesspit. All sties should face the south, and be well above the surrounding ground, so as to be thoroughly dry.

I am sure that if the scheme I have outlined is followed, pigkeeping will prove a profitable undertaking for all local authorities, and be of great benefit to the surveyor of the town or district where it is attempted.



Detail of Feeding Trough.



Section.

BOGNOR MUNICIPAL PIGGERIES: BREEDING PENS.

(Scale ¼ in. = 1 ft.)

EYE CORPORATION AND THE BY-LAWS.

At the last meeting of Eye T.C. the Public Health Committee reported consideration of the question of waiving the by-laws as to pig-keeping. On the advice of the medical officer of health they recommend that no alteration be made, and this the town council agreed to.

TIMBER HAULAGE AND ROAD DAMAGE.

THE COST OF REPAIR.

On the 22nd, in the House of Commons, the Secretary to the Local Government Board was asked whether his attention had been called to the burden that ratepayers in certain localities were called upon to bear in consequence of the damage done to the highways by the haulage of quantities of timber; and whether, as the timber was cut and required for national purposes, he would endeavour to arrange by legislation or otherwise that some portion of the cost for the repair and maintenance of the roads in the districts affected should be borne by the National Exchequer, and so not fall entirely upon the local ratepayers.

Mr. Hayes Fisher stated that only one or two specific complaints on this subject had reached Lord Rhondda. He (Mr. Hayes Fisher) understood that arrangements had been made by the Department concerned whereby, in cases of damage caused or likely to be caused by the hauling of timber on behalf of the Home-grown Timber Committee, such repair and strengthening of the roads as was considered necessary to keep them fit to carry this traffic was undertaken by the Road Board on behalf of the Committee, and the cost of the work was defrayed out of funds at the Committee's disposal.

Government and Ferro-Concrete.—In the House of Commons the Financial Secretary to the War Office was asked whether, having regard to the high price of timber and the difficulty in obtaining freights for the importation of supplies from over the seas, he would ascertain if his Departments were making the fullest use of concrete, which was a material entirely of home production and which could so often be used instead of timber for constructional purposes. Mr. Forster said the question of using concrete and ferro-concrete for constructional and other purposes was being carefully considered by the War Office in connection with other Departments.

Cultivation of Lands Order, 1916.

By REGINALD BROWN, M.INST.C.E., Engineer and Surveyor to the Southall-Norwood Urban District Council.

[*Continued from last week.*]

The Order gives power to a council to arrange with any owner willing to cultivate or make arrangements for cultivating land taken over by the council, and may also delegate the other powers of the council with respect to the matters covered by the Order. Some councils have availed themselves of such powers, but it seems to the author that the council is the sole responsible authority for taking the land, and that a council cannot delegate this power to any committee outside their own body. Some councils have even gone so far as to hand over this power to War Agricultural District Committees, and how far they are entitled to do so is an interesting point—it has not arisen in the author's district.

The Order distinctly states that the land shall not be used for the production of vegetable crops which continue productive for more than one year, or for grazing.

It is also interesting to note that the tenancy may be terminated at any time, but from the provisions as to compensation it may be assumed that not more than one crop ought to be depended upon. This point is important, and a person must be a very keen gardener, and to have realised the importance of the food problem to undertake the labour of preparing a plot of ground and putting in potato seed for one crop only. It is, however, foreshadowed that the tenancy may be made to extend beyond January 1, 1918. The provisions of the Order governing compensation are important. The regulation under which the Order is made provides that if the determination of the tenancy takes place before January 1, 1918, the board will pay the compensation as may have been agreed upon when entering into possession; or, if there is no provision in the agreement as to a definite basis for compensation, then the board will settle the amount of compensation to be paid and which shall be just and reasonable.

In the Order itself the arrangement made for cultivation shall not provide for payment of compensation in excess of the value at the time of quitting of the crops growing on the land, and the labour expended upon and manure applied to the land since the taking of the last crop in anticipation of a future crop. It thus appears that notice of termination of tenancy may be given at any time, but that no compensation is payable after January 1, 1918, in any case; for instance, unless the provisions of compensation are altered by a future Order, a man may receive notice to quit on January 1, 1918, and receive no compensation, while if notice to quit is given on the last day of December the compensation provision will come into operation, but only to the extent indicated. Cultivators should therefore quite understand that whatever they do to the land—after removing the first crop—they have to be done at their own risk and expense.

With the hoped-for promise of extension beyond January 1, 1918, many cultivators will no doubt take the risk and begin preparing the land for the next year's crop, unless intimation is given in good time that the tenancy will not be prolonged. It is therefore hoped that the Board of Agriculture will in good time make a definite pronouncement on this point, as it will save a good deal of heartburning and friction.

Of course, it does not follow that, even if the agreement is terminated by the council, under the Order, after January 1, 1918, arrangements cannot be made by the cultivators themselves with the owner of the land for the continuance of the tenancy, and probably a fair majority will endeavour to do so, all it means is that the council have finished with their responsibilities in the matter and the future terms must be settled by the cultivators themselves. There is no doubt that the board will also either indicate a guide line to the basis on which compensation shall be fixed or will themselves undertake the settlement of the compensation by official valuer.

The next point of importance is that due to any permanent injury affected by any deterioration of the land caused by the exercise of the powers under the Regulation, but if the amount of compensation cannot be agreed upon, then provision is made for settlement by arbitration under the Agricultural Holdings Act, 1908. It should be noted that it would not only better the owner who is to be paid compensation—the provision is much wider than this. On the face of it, it does not seem possible for compensation to be claimed for merely cultivating the land; but those with experience of claims will realise that the settlement of points arising out of this provision may be a fruitful source of litigation, and it will be at the end of the tenancy when the fun will begin.

The author could mention several points on which claims for compensation can be based, but each owner must obtain his own advice on the matter. It is sincerely to be hoped that any claim which is proved to be frivolous and vexatious, and which never ought to have been made, will carry with its dismissal the costs of the arbitration. A council itself must not, however, by the Order do anything which involves the Board in a liability exceeding £2 per acre; otherwise they may find themselves in the unfortunate position of having to meet the expense out of the rates. A council should, therefore, be particularly careful in their expenditure and actions, and when they have delegated their powers to committees not composed wholly of members of the council it is essentially necessary to limit such powers—the council are responsible, and cannot hand this responsibility on to other shoulders. As previously mentioned, in the author's district the council has left the whole matter in his hands, and to the time of writing he has taken over and let on their behalf 630 ten-rod plots in various parts of the district, and could still do with more.

The author does not consider at any rate at the present time—that public parks and recreation grounds should be cut up. These are open spaces for the whole population, and in a large number of cases would entail a very large expense in replacing them in their present condition when the war is over. There are, of course, cases where the cultivation of such areas might be advantageous, and might even be necessary, especially in those districts in which very little unoccupied land exists.

Probably the most difficult operation connected with the Order is that of obtaining the necessary seed potatoes. The Order gives power to a council to purchase any seed, manures or implements required for the cultivation of the land, and to sell any article so purchased to the cultivators, or allow their use of the implements at a price, or charge sufficient to cover the cost of purchase. This clause is "municipal trading" with a vengeance, as by it a council is in a position to purchase things not made by themselves and to sell. The position is somewhat invidious, as whilst a local authority can trade under the Order, in the widest sense of the term, they are not permitted to trade in things made by them out of material which they are bound to get rid of. I have laboured this point elsewhere, and it is therefore unnecessary again to deal with the point here, but your readers are aware of the things to which I refer. The author had so few applications for manures or implements that he decided it was best to limit his scope to the provision of seed potatoes.

(To be concluded.)

Advice for Allotment Holders.—Hackney Council has arranged that men in the parks department shall give advice and instruction to people who have taken up allotments.

The Pudlo Treatment of Cement.—A reader whose curiosity had been aroused by repeated advertisements in this journal wished to prove whether Portland cement was really watertight. He constructed two fish-ponds, one with cement and sand, and the other with Pudloed cement and sand. The former required to be constantly supplied with water to maintain the level, but the other was proved perfectly non-porous. The makers of Pudlo inform us that they will be glad to send, free of charge, to any interested reader sufficient Pudlo to enable them to make a practical test.

Reinforced Concrete Road Bridge Construction.*

By C. D. SNEAD, Bridge Engineer, Kentucky Department of Public Roads.

Good roads demand good bridges—bridges which are safe, strong, sightly and durable.

No attempt will be made to discuss the relative value of the parabolic and straight line formulæ; neither the theory of concrete design nor the theory of simple, restrained or continuous beams. The design of concrete structures is a part of bridge engineering, and bridge engineering is recognised today as a speciality. The design of a concrete bridge should at least receive the same careful consideration and thought that is given a steel structure. No structure, no matter how small, should be designed by one other than an experienced structural engineer of known ability and judgment. There is no doubt that many structures have failed and others are failing, due to the defective design. Failure may result also from the use of faulty materials, poor execution and premature removal of forms, or, perhaps, to a combination of such causes. Eliminating the theory of design, we shall later endeavour briefly to discuss the economy, type and cost of concrete bridges and the remaining causes of failure and their prevention.

We may lay down three simple rules for the choice of a bridge site:—

1. Pick out a situation where the axis of the stream is as straight as possible for several hundred feet and lay out the bridge at right angles to the stream. Crossings at other angles than a right angle are necessarily longer and more expensive.

2. Be sure that the site chosen offers good foundation; bed-rock if possible, or a heavy deposit of boulders or cemented gravel. Otherwise the cost of piles or some artificial foundation must be incurred.

3. Remember that the bridge is an integral part of a road system, and that to fulfil its purpose a bridge must at all times be accessible. This requires that a bridge shall be situated where it not only will best serve the community, but also where well-graded approaches above extreme high water may be constructed with the least possible outlay considering both grade and alignment. The cost of approaches must be reckoned in with the ultimate cost of the bridge.

PRELIMINARY INVESTIGATIONS.

After a bridge site has been chosen the engineer's duty is not simply one of running a transit line and thereafter the necessary levels from which an accurate profile may be plotted. The engineer who is to design the structure needs all the information that can possibly be secured. This information should comprise an accurate report on nature and depth of foundation, the elevation of maximum high water, the approximate length and breadth of the drainage area, the current at both low and high water stages, and contours to show clearly the nature of the bridge site. Of prime importance is the cost, length of haul and information concerning the local materials available for bridge construction. If there is doubt as to the advisability of the use of local material do not report that the materials may be used if approved by the engineer, but send in samples for test in order that it may be definitely ascertained before bids are requested. Lastly, do not guess concerning foundation conditions, but investigate thoroughly. The design and cost of a structure not only depend upon the information concerning the foundations, but the very life of the structure may depend upon such if a hasty decision is reached and a foundation used which is questionable.

Each bridge site presents conditions which may constitute a problem in themselves. In general, it is to be recommended that box culverts or arches be used for spans from 2 ft. to 6 ft., flat slabs or arches from 6 ft. to 16 ft., I-beam girder spans or arch forms from 16 ft. to 30 ft., and thereafter half through or through girder spans or arches for spans 30 ft. to 45 ft. Beyond this limit of 45 ft. arches may prove the cheaper type of construction, depending upon the site and foundation conditions. Plain concrete arches are and have been designed. Reinforced arches are to be preferred. No arches are to be recommended unless an unyielding foundation is secured. The width of roadway that is used should never be less than 16 ft., and should preferably be 18 ft. in width. Cheap types of handrails, some requiring constant maintenance, have been used. These savings on a cheap type of handrail are soon forgotten, but the appearance of the rail until rebuilt constantly detracts from the structure. Bridges composed of several units of equal length, within certain limits of heights of piers and abutments, are cheaper than a design with one long span. The waterway should not be crowded to effect this saving.

All cement, regardless of its brand, should be tested. Although subject to rigid inspection, poor cement of a good grade finds its way to the market, and tests are necessary to make sure that this cement does not find its way into the work.

MATERIALS.

The strength of concrete depends not only upon the cement, but upon the aggregate stone and sand. For reinforced concrete, stone varying from ¼ in. to 1 in. is recommended. All stone is not suitable for concrete work. Only stone free from weather or disintegration and of a kind known to be durable should be employed. The life and strength of concrete will depend upon the aggregate employed.

The question has been asked why graded stone is specified and why the size of stone is limited to 1 in. By using graded stone we obtain the densest mixture. The smallest percentage of voids occurs in a graded mixture, so graded that the voids of each size are filled with the largest particles which will enter them. The size of stone is limited to 1 in. to allow the aggregate to be properly placed around and between the reinforcing bars.

Formerly not enough attention has been paid to sand. The sand should be free from loam in excess of 4 per cent., well graded from fine to coarse, and free from vegetable matter. The grade of sand should be as carefully selected as the grade of stone, and should be equally as hard and durable. Much money can be saved by proper sand tests and recommendations resulting therefrom in regard to the proper proportion of aggregates.

To cheapen the cost of reinforced concrete bridges, sometimes an inferior grade of steel reinforcement is employed. To cheapen the cost of a structure by the use of inferior materials cannot be too strongly condemned. With the limited tests and inspection of reinforcement, the use of "high carbon steel" reinforcement is not to be recommended. Reinforcement consisting of deformed bars of structural (medium) steel should be used. There are many types of deformed bars, some proving more satisfactory than others. It has been shown by tests that the cold and hot twisted bars have not proved as good as many other types of deformed bars, and for this reason we do not recommend their use if a better type of deformed bar can possibly be secured. It is necessary that the steel should be most carefully wired in place and spaced in accordance with the dimensions shown on plans. Poor execution of the plans may spell failure for the design. Reinforcement should be free from scale, rust, oil, paint, or any coating which would tend to decrease the bond.

Failure of concrete structures may occur even if the proper aggregates are secured. To guess at the proportion used, and, perhaps through lack of thought or through carelessness, to jeopardise the reputation of the designing engineer by not seeing his plans minutely followed, should not be countenanced. Bottomless boxes or some similar device should be required on all jobs for measuring accurately the aggregates. After the aggregates are measured they should be properly mixed. Too much water is as harmful as too little water. The mixture should be in a "quaky" form when leaving the board or mixer. The ingredients should be thoroughly mixed until they are of a homogeneous appearance and colour. Mixing by machine will require not less than one minute, while mixing by hand will require that the ingredients shall be turned together at least six times.

Concrete, after the completion of the mixing, should be handled rapidly to the place of final deposit. Under no circumstances should concrete be used which has partially set. Concrete should be so deposited as to permit the most thorough compacting. All exposed

* From a paper presented to the annual meeting of the County Road Engineers Association of Kentucky.

[illegible] should be thoroughly spaded with a straight [illegible]

FORMS: THEIR CONSTRUCTION AND REMOVAL.

One [illegible] would not be complete without a few words in regard to forms. Forms should be constructed true to grade and line, thoroughly braced in all directions and set straight. The interior of all forms should be [illegible] to prevent the concrete from adhering. In a structure built for permanency, great attention should be paid to the forms, or else a bridge which will detract rather than add to the surrounding scenery will result. Failure of concrete structures can be traced to the premature removal of forms. Forms beneath girders, arches or slabs should not be removed in less than twenty-one days in warm weather. In freezing weather it is well [illegible] to retain one day in excess of the above twenty-one days for each day the temperature is 30 deg. Fahr. or below. In no case should the forms be removed until the concrete beyond all doubt has thoroughly hardened. The removal of forms should be left to the judgment of an experienced man.

Upon the completion of the work provision must be made for the proper curing of the concrete. The new [illegible] must be protected for a period of not less than one week from the direct rays of the sun. This [illegible] by the use of canvas, straw, or sand. The new concrete should be kept wet during this period. In freezing weather no concrete work should be [illegible] the ground unless the water and [illegible] are thoroughly heated. And thereafter the [illegible] protected. No salt should be [illegible] concrete.

In [illegible] we should not overlook the aesthetic features. When bridges and culverts are constructed of permanent materials it should be remembered that any æsthetic defects that may exist will become more and more apparent as the country [illegible] to the structure develops. Concrete is well adapted to artistic designs. However, it should be borne in mind that concrete is a material of itself and [illegible] be used to imitate other material. If form marks and the dead surface be objectionable, they can be erased by rubbing the surface after it is hard or rubbing while green. The [illegible] surface should be avoided as it is likely to peel off under the action of frost and temperature changes.

In conclusion, for strength, for solidity, for durability and for true economy reinforced concrete must be accepted as the material which excels all others [illegible]

RATES OF INTEREST ON LOCAL LOANS.

[illegible] Treasury give notice that, in pursuance of the powers in that behalf given by the Public Works Loans Act, 1897, they have been pleased to direct by their Minute of March 28, 1917, the rates granted under the Local Loans Fund, alternately to the date of their Minute, [illegible] the rates fixed by Treasury Minute of March 31, 1916, the following [illegible] Loans to local authorities for any purposes of the Housing Acts and the Small Holdings Acts: Any period not exceeding 50 years, 4¼ per cent. Other Loans secured on Local Rates: Not exceeding 30 years, 4¼ per cent.; exceeding 30 years, 4½ per cent. Loans for Land Drainage on Local Rates or Loans under the Harbours and Passing Tolls Act, 1861, or the Improvement of Property Act, 1899: Not exceeding 30 years, 4¼ per cent.; not exceeding 50 years, 4½ per cent. Loans to Water undertakers: Not exceeding 30 years, 4¼ per cent.; not exceeding 50 years, 4½ per cent. Loans under the Housing Acts to [illegible] private persons limiting their profit [illegible] Treasury Minute of November 14, 1916: Not exceeding 30 years, 4¼ per cent.; not exceeding 50 years, 4½ per cent. Loans to companies and private persons not limiting their profit: Not exceeding 30 years, 5 per cent.; not exceeding 50 years, 5½ per cent.

City of London's Waste Paper Collection. For the [illegible] to the City of London the Corporation [illegible] months [illegible] Liverpool of £5 for [illegible]

HOUSING AND TOWN PLANNING IN THE MIDLANDS.

CONFERENCE AT BIRMINGHAM.

The Midland Counties Conference arranged by the National Housing and Town Planning Council took place on Thursday and Friday last week at the Council House, Birmingham. The Lord Mayor of Birmingham (Alderman Brooks) presided at the opening, and Councillor Harold Shawcross took the chair after his lordship's departure. Representatives attended from Birmingham, Nottingham, Coventry, Leicester, Stafford, Worcester, Hereford, Shrewsbury, Walsall, Wolverhampton, Lichfield, Kidderminster, Redditch, Cheltenham, Nuneaton, Newcastle-under-Lyme, and other districts.

The LORD MAYOR, in his opening speech, referred to the question of town planning, and said he hoped that before long the committee of the Birmingham Corporation which had this matter under consideration would be in a position to introduce to the council a scheme by which the small area in the centre of the city might be surrounded by a circular road, to which would be linked up arterial or radial roads; in that way they might be able to provide increased facilities for passing from one part of the city to another and for the transit of merchandise coming into or going from the city. With respect to housing, the Birmingham Special Housing Committee had submitted a report stating that, in their opinion, the best way to aid the resumption of building activity was for the council to purchase estates in the undeveloped areas, to develop them by constructing roads, laying sewers and mains, providing easy access to them, and letting them in building plots to public utility societies and builders, imposing suitable restrictions. That policy might assist them, but it would be requisite to obtain financial assistance from the municipality or the Government.

Councillor SHAWCROSS (Rochdale), chairman of the National Council, proposed a resolution appealing to the Government to give legislative effect to a scheme for providing healthy homes in districts where the shortage of houses had become a menace to the health of the community, and averting any crisis of unemployment which might arise in the building trade at the close of the war. The resolution also urged local authorities to appoint housing committees to make inquiries as to the housing needs of their areas, and, where there was a shortage, to select suitable land for building houses and secure options for the purchase of the same, such options to be exercised at the close of the war; and, further, to plan out such land on town planning lines.

Councillor WALSH (Wolverhampton) seconded the proposition, and in the course of the discussion Mr. H. R. ALDRIDGE (the secretary) said it was estimated that 50,000 or 100,000 houses should be provided every year to keep pace with the demand. While on the one hand it was asserted that private enterprise in building houses had failed, it was denied on the other that it had failed to the extent some people imagined.

The resolution was carried unanimously, and it was arranged that a deputation should wait upon the President of the Local Government Board to urge the Department to press upon local authorities the necessity for taking action upon the lines suggested.

A resolution was adopted advising the removal by legislation of an admitted obstacle to the building of working-class houses in the Finance Act of 1909.

Upon the motion of Councillor G. CADBURY, junr. (Birmingham), seconded by Mr. WARD (Shrewsbury), a resolution was agreed to urging upon local authorities the necessity of meeting the demand for houses after the war by taking steps to promote and press forward the preparation of town planning schemes. The mover alluded to the importance of arterial roads with a width of 120 ft., and, with regard to factory areas, stated that they had adopted in Birmingham a system of options, sites and sites which should be exclusively residential.

Mr. H. E. STILGOE (city engineer and surveyor of Birmingham) moved: "That this conference, recognising (*a*) the pressing need for improved arterial road construction in the great industrial areas represented at this conference and (*b*) the great value of the Town-Planning provisions of the Housing and Town-Planning Act of 1909 in enabling arterial road schemes to be planned and carried into effect at a minimum of cost, appeals to His Majesty's Government for the

establishment of a series of district conferences to be held under the auspices of the Local Government Board, on similar lines to those already formed for Greater London, in order that the needs of the various districts and the possibilities of combined action may be fully examined and made the subject of a special report to His Majesty's Government."

Mr. E. G. Mawbey (borough engineer of Leicester) seconded, and the resolution was agreed to.

Resolutions were also accepted (1) in favour of the National Housing and Town Planning Council preparing and submitting to the Government proposals providing that local authorities should be required to make preliminary town-planning schemes; (2) making representations to the Government that the timber and fittings of dismantled war buildings should be made available for cottage building schemes; and (3) the desirability of provision being made for the compulsory billeting in country towns and country houses of women and girls volunteering under the National Service scheme.

Following the above conference, an informal conference, which was well attended by architects, municipal engineers, and others, was held on Saturday last at the offices of the National Housing and Town-Planning Council in Russell-square. The object of the meeting was to gain an expression of opinion from those present as to the desirability of holding a two-days' special conference at some centre convenient for the whole country, and to discuss various questions which had been raised at the Birmingham conference. As the Press were not invited to attend this informal conference, we are unable to state if any definite conclusions were reached.

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάνθ' ὁρᾷ

(One man does not see everything.)
—Euripides.

AN ALIBI.

To the Editor of The Surveyor.

Sir,—I have for many years had an unbounded admiration, mixed, perhaps, with a feeling of "holy terror," for the prescience of the British Press, which considers itself capable of directing all our doings, ranging from such trifling matters as running a great war down to the more prosaic duty of mending our ways, not only moral, but those of a material character. I was a bit flabbergasted, however, to find the Press, as represented by your journal, now appears to have sufficient psychological power to discover an individual in a place many miles distant from where he, poor fool, thought he was, and to be able to report his sayings and doings in a spot where he was not aware he had been for several months. On page 313 of your issue of the 23rd inst. your humble servant is represented as appearing before a tribunal at Horsham, in Sussex, to appeal for exemption for a mechanic engaged on the repair of such mundane things as steam rollers, and to have succeeded in persuading the tribunal, by his eloquence, to give heed to his desires. Now, this is either a case for grave consideration by those societies who dabble in the occult, or one of mistaken identity. If the latter, I still think there must be something of the uncanny about it, as I cannot otherwise understand your reporter confusing the decrepit form, the cadaverous face, and thinly-strewn, though carefully arranged, grey locks of the county surveyor of Surrey with the youthful yet burly figure, the bucolic countenance, and the well-thatched cranium of my good friend who usually attends to matters of the character referred to in the county of West Sussex. The war has resulted in a good many changes, which aforetime we should have considered almost impossible, but I have not hitherto come across such a striking case of rejuvenescence.—I am, Mr. Editor, your sceptical but admiring humble servant,

A. Dryland

Kingston-on-Thames.
March 24, 1917.

[We must rub up our geography. The errors in the paragraph dealing with the matter to which Mr. Dryland refers arose during the process of subediting. Neither the name of the council concerned nor that of its surveyor was given in the report as received by us, and the mistakes occurred in dealing with these omissions.—Ed. Surveyor.]

USE OF STUDS ON ROAD LOCOMOTIVE WHEELS.

To the Editor of The Surveyor.

Sir,—The question of the Local Government Board having withdrawn the restrictions with regard to studs in the driving wheels of traction engines is a very serious one indeed for highway surveyors, and should be protested against not only by every council, but by every surveyor in the country, as the damage likely to be done to road surfaces by such studs cannot be estimated.

I remember a few years ago a traction engine passing through Chester with studs in the driving wheel, and in the wood paving over which it passed every 12 in. apart these studs punched a hole about the size of half a crown in diameter, and about 1 in. to 1¼ in. deep, also doing considerable damage to the granite paving over which it passed. This, of course, was done when the Local Government Board restrictions were in force, and the corporation successfully claimed £80 from the owners of the traction-engine for the damage which they had done.

If it is necessary for something to be done, why cannot there be a "box" arrangement put over the driving-wheel of a traction-engine which would carry, say, half a ton of very fine sand or grit? If a frost occurred during the night this box could be filled up, and the driver, by means of a small lever (when the traction-engine was travelling on any particularly bad part of road) could open a small aperture, and so allow the sand or grit to fall out in sufficient quantities to enable the engine to travel in safety over the road. In Chester we have an arrangement (which I suppose is in force in other towns as well) whereby sand can be put upon the tramway metals by the driver of a tramcar if he finds that the rails are greasy, and this has a wonderful effect on the pulling up of the cars if they are going too quickly or get somewhat out of control.

I feel sure that someone could easily fix an arrangement of this kind on a traction-engine, and sand or grit can always be obtained in any particular district.—Yours, &c.,

W. Matthews Jones,
City Surveyor.

Chester, March 22, 1917.

THE CIVIC SURVEY OF S.E. LANCASHIRE.

To the Editor of The Surveyor.

Sir,—I have no wish to disturb the satisfaction Prof. Abercrombie derives from his letters, but when he talks of deriving this satisfaction from unmasking my motives, and accuses me of active hostility and prejudice because I cannot see eye to eye with him on the engineering side of town planning, it makes me feel that I must be living in Berlin or Petrograd instead of sober England. Possibly the Professor's recent visits to the homes of the Sinn Feiners have had something to do with his newly acquired suspicions, but I can assure him I am not built of the stuff of which conspirators are made.

I have the greatest admiration for the great work the Professor has done on the artistic side for town planning—probably more than any other man in this country—but it is surely no sign of disrespect to say that he is an artist first, and as an engineer makes a bad second. Unfortunately, because Michael Angelo was said to have been not only a great artist and sculptor, but also an architect and engineer, architects of the present day consider themselves qualified to play a similar *rôle*. While they are continually bemoaning the decline of architecture since the days of the ancient Greeks, they overlook the fact that engineering has seen its greatest advance during the past and present centuries, and the architect of to-day finds any but the simplest engineering problems outside the scope of his training and experience.—Yours, &c.,

The Writer of the Town Planning Article.

March 27, 1917.

Institution of Mechanical Engineers.—Mr. Michael Longridge will deliver his address as president of the Institution of Mechanical Engineers at a meeting of that body to be held on Friday, April 20th. The chair will be taken at 6 p.m.

Stone-Filled Sheet Asphalt Pavement.

By CHARLES A. MULLEN, Montreal.

[Stone-filled sheet asphalt pavements have been laid in a number of streets of varying grade in Montreal carrying light, medium, and heavy traffic, and a recent issue of the "Canadian Engineer" contains an instructive article—from which we make the appended extracts—dealing with the work.

These pavements are not of the very highest quality as the mixing plants of Montreal have not yet been organized fully so as to get the best possible results, but they are fairly good types of this construction, and will probably give service for a number of years to come. The surface on one street was laid over an old bituminous macadam road.

The stone-filled sheet asphalt surfaces are apt to look somewhat rough when first laid, but this initial roughness passes away after one or two summers' traffic, and leaves a surface almost as smooth as that of the usual sheet asphalt, and has a pleasing mosaic appearance when clear enough for the stone-chips in the surface to be seen.

The construction of these stone-filled asphalt pavements in Montreal was the result of the writer's recommendations to the city engineer.

There is nothing radical or new about these pavements. The altered mixtures and the methods of laying are rather a return to earlier practices than have, in the light of experience, proved both correct and economical. What has actually been done is to eliminate entirely the so-called binder course, and to introduce into the surface mixture, as formerly laid, sufficient ½-in. stone chips to have in the completed mixture between 25 and 30 per cent of this material. The two items should be considered entirely independent of each other, as either change might be made to advantage even without the other.

The stone-filled sheet asphalt pavement has demonstrated its ability to withstand both heavy slow-moving traffic on iron-tired, horse-drawn vehicles, and heavy fast-moving traffic on rubber-tired, self-propelled vehicles. It is both desirable and economical for use on the heavy-traffic business streets of a city, and its actual cost is so low that it is the most economical pavement for light residential streets and boulevards. It should therefore be adopted by most cities as the standard form of pavement construction, and varied from only where a too steep grade or other special condition makes it imperative to do so.

It may be assumed that in nearly every case the stone-filled sheet asphalt mixture will cost about 2½d. per square yard less than the mixture without the stone-filling. While such a saving is well worth consideration, it is not on that account that the writer has advocated the use of the mixture containing the stone chips, but because, even at the same or a slightly higher cost, he considers it a better and more economical pavement surface than the other. It retains the merits of the usual sheet asphalt and combines with them certain other features that are very desirable and well worth considering.

The advantages of the stone-filled sheet asphalt mixture over the mixture without the stone chips are as follows: (1) It is less slippery; (2) it marks up less in summer; (3) it is easier of traction in summer; (4) it is less liable to displacement; (5) it costs less.

The pavement should be looked upon as a standard sheet asphalt mixture to which has been added a certain percentage of fine stone chips, not in any case exceeding 30 per cent, to act as a reinforcement, and thereby produce the physical results noted above. It is not a true asphaltic concrete, nor is it intended or desired to be such.

ELIMINATING THE BINDER COURSE.

The best reason for the elimination of the so-called binder course, used as an intermediate course between a sheet asphalt pavement and a concrete foundation, is that its legitimate reason has yet been announced why it should be there, and it costs, laid as it is, about 10 per square yard. It would seem that before a city laid out such a sum of money on such foundation as that of an asphalt paving it would know why it was doing so, and that it would get value for the money. The writer has asked many city engineers and others who were laying the binder course, and has not yet received a good answer from any of them. So has asked many of the country's best experts, and has also failed to enlighten him.

In the first place, let us understand that the so-called binder course is not, properly speaking, a road course at all, but an intermediate course that will have to explain its being on some other grounds. The paint coat is the only real binder course, and that is not good practice for several reasons, the principal of which is that it is not needed. The so-called binder course does not adhere to the concrete foundation any more than does the wearing surface proper when that is laid upon it direct. Either can be removed with equal ease, there being no bond at all between them and the concrete foundation; and in fact none is required.

The development of intermediate constructions between sheet asphalt pavements and their concrete foundations has been as follows:

First, we had the so-called cushion coat, which consisted of a layer of the top course put in place and consolidated before the final layer was placed. The principal reason for this construction seems to have been to secure proper compression on a greater thickness at that time believed to be required. Other theories were developed for its use; but all have since proven fallacious, and the cushion coat has been abandoned everywhere. It differed from the top mixture only in that less stone dust and proportionately more asphalt cement were used, and, as it was to be buried at the bottom, no one thought it necessary to bother making it very good.

Then we had the paint coat, which was exactly what its name implies—a coat of naphtha and asphalt paint applied to the concrete foundation before the surface was laid. This coat of asphaltic paint penetrated a short way into the surface with the naphtha and then melted again under the hot asphalt surface and bound to that. It was a real binder course, as any one knows who has had to make repairs on streets where it had been used. Finally, some one seems to have tumbled to the fact that the asphalt surface was quite willing to remain upon the concrete foundation without being bound there, and the paint coat has not been laid to any great extent for a number of years. A useless expense and a good riddance.

Next we had the open binder, which consisted of ¾-in. crushed stone coated with asphalt cement and laid in a course 1 in. thick upon the concrete foundation before the asphalt wearing surface was placed. This was useful in covering up the incompetence of contractors and engineers when they had laid such a poorly lined-up concrete foundation that wearing surface could not be laid upon it until some cheaper mixture had first been used to level it up, so the cities on this continent invested several millions of dollars in this needless material. Then some bystander, who had a presentiment of a large special assessment on the way, happened to ask why the so-called binder course was being bought and paid for with his money.

The question was a poser. It would not do for the engineers and experts to admit that they had been squandering public money on something the reason for which they did not know, so they improved the open binder course by putting a little sand in it and calling it a closed binder course. Now, the open binder course is quite universally condemned as being an actual detriment to asphaltan pavement, and the virtues of the closed binder course are freely extolled, without being very definitely stated.

The so-called closed binder course, when well laid, is a "bitulithic" pavement. When used as a wearing course, it is covered by certain letters patent that have created a new and useful monopoly in the paving field. It appears to be quite customary to lay asphalt wearing surfaces on top of such pavements, and then call them closed-binder courses, thereby making sure they will not wear out, and at the same time avoiding the patents. Possibly some one can state a sound reason for laying a second-rate pavement surface under a first-rate one, the writer cannot.

The most commonly advanced argument in favour of the use of the so-called binder course is the claim that it prevents the surface from shoving. The

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writer has seen many instances of shoved or displaced pavements, but he has never seen a properly-constructed asphalt pavement shove, nor has he seen an instance where a binder course has kept a poorly-constructed pavement from shoving; and certainly he has seen a number of poorly-constructed asphalt pavements shove, both with and without binder courses. But even if a so-called binder course would keep a poorly-constructed pavement from shoving, as some of its advocates claim, there seems no reason why a city should pay 1s. or more per square yard to secure a result that would be equally obtained by an additional expenditure of not to exceed 2½d. to 5d. per square yard for additional materials and services to secure a high-grade asphalt pavement without such a binder course.

There is one other reason for not using a binder course. The future maintenance of asphalt pavements will very largely be accomplished by the re-use of the old surface materials, and thereby at greatly reduced costs. When we get to that, the binder course will prove itself an unmitigated nuisance; but that is a subject for another story.

THE SCARCITY OF SMALL HOUSES.

MANCHESTER CORPORATION'S ACTION.

Manchester City Council on Wednesday adopted a proposal for the appointment of a special committee to inquire into the local housing conditions; to ascertain the causes of the present shortage of houses, past methods of providing houses, and the accommodation necessary adequately to ensure the comfort, health, and moral well-being of the community; and to make definite recommendations whereby a sufficient provision of suitable houses might be secured.

It was stated that the position of the housing problem was serious in Manchester before the war; it had become intensified since, and it would be greatly aggravated when demobilisation came. In the six years ended in 1903 there were 20,157 houses erected in the city as at present constituted, in the next six years 18,570, and in six years ended in 1916 only 7,061. Each year after 1909 there had been a gradual diminution, until last year, instead of an average of 3,616, such as was experienced in the first six years referred to, only 119 new houses were erected.

Housing After the War. Replying on Tuesday to a question in the House of Commons, Mr. Hayes Fisher said Lord Rhondda held strongly the view that the provision of better housing accommodation was the most pressing problem that the Local Government Board would have to deal with after the war. The matter was now engaging his serious attention.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Will the Manchester Corporation purchase Haweswater, near the Lake District, for an increased water supply, and, if so, will it affect the appearance of this beautiful lake when the work of transforming it into a reservoir is completed? Need we have any fears on this account, however, if the works are carried out in a similar manner to those at Thirlmere after the corporation secured the lake of that name in 1894 for a similar purpose? Would any tourist who visits Thirlmere be able to say that its appearance had been affected by the works which converted it into a reservoir?

* * * *

Why is it that when there is a town planning conference, of even the smallest dimensions, so many town councillors attend them as "delegates"? Is it because they have such a keen interest in the movement, or is it because, thanks to the action of a former President of the Local Government Board, the district auditors have been instructed not to surcharge the expenses incurred in attending these conferences? Why is it that a similar privilege is not extended to surveyors who attend the important meetings of the Institution of Municipal and County Engineers?

* * * *

Apropos of town planning, why is it that in so many schemes the crying need of cheap houses for the working classes receives so little attention? Is not this need going to be one of the most difficult problems after the war, and should not all town planning schemes provide a very large proportion of houses of this description, instead of aiming merely at the construction of wide boulevards and thoroughfares?

* * * *

Would not the erection of cottages for the working classes be greatly cheapened if they could be standardised, both in the matter of design and the nature of the materials used? Have not standardised parts of certain machines brought down the cost of those machines, and would not a similar result be obtained by the application of the system to house building?

* * * *

Were there not some very interesting experiments recently carried out by the United States Department of Agriculture in order to fix the best width of wagon tyre for any given load? Would the conclusions arrived at, as set out herewith, coincide with our own investigations into this matter—viz.: (1) Gross load 5,000 lb., the unit draft (or pull) decreases with the width of tyre up to and including a 5-in. width of tyre; (2) The unit draft (or pull) decreases directly as the weight per inch width of tyre decreases until a weight of 250 lb. per inch of tyre is reached? Do not these results show that there is no advantage in increasing the width of tyre beyond a certain point?

* * * *

Is not now the time for municipal surveyors throughout the country to exercise their ingenuity in carrying out all the saving and economy in materials and labour that are humanly possible? Will they not rally to Lord Rhondda's call for this assistance as expressed in a recent circular emanating from the Local Government Board? Is it not also the duty of every citizen to assist in this movement if we are to help our country to win the war?

* * * *

Does it not appear from the recent annual report of Dr. J. Holroyde, the medical officer of health of Chatham, that the sanitation of this important naval and military base is not all that could be desired, when we read that, in addition to proper water-closets, there are "closets with pans and traps, but without a flush," "trough closets in use at schools flushed *once* or more daily," and "open privies"? Is it a matter of surprise that he calls special attention to the danger of this last insanitary type? And though he says that every year sees a reduction in the number of this class of convenience, will it not take a long time to convert these abominations when we read that in 1915 the number of conversions was only eighty-six? Dr. Holroyde also calls attention to the unsuitable type of the receptacles for the house refuse. Is it not evident that some immediate and drastic action should be taken by the sanitary authority of this town?

Town Planning in Southern India.*

By H. V. LANCHESTER, F.R.I.B.A.

Despite the great conservatism of India the advantages of good communications and transport facilities have been universally recognised, and the difficulties this must make to social organisation is easy to grasp. We know the history of railway development at home and can readily imagine such a development at its early stages. That is now the condition in India, and it would be, to a large extent, possible to guide this movement with more wisdom than has been employed in the past. I dare not say that this is actually the usual course; too frequently there is the same obsession that all other demands must give way to those of the railway. Railway companies are divorced from all the others, and the result is necessarily fallacious.

My work last year having been mainly in Southern India, I propose to confine my review to this part of the Indian Empire, as in many ways there are marked differences between this and the more northern provinces.

PLANNING SCHEMES.

It is out of the question to attempt to follow in detail all the phases and problems with which I had to deal, and I shall limit myself to a brief review of the more important. It is necessary to explain that, while the Madras Town Planning Act is not yet in operation, the Indian is so accustomed to the authorities taking the initiative that in many cases town extensions are being undertaken by the municipality under Government control and advice, while at the same time a good deal of pressure can be brought to bear on private enterprises. On the other hand, by-laws are loosely drawn up and interpreted, and are very difficult to get enforced owing to the meagre recognition of their duties among the newly-formed corporations. Encroachments on public roads have been tolerated for so long that those needing more room regard it as rather a hardship if they cannot filch a strip from the road, especially if their neighbours have already done so a few years back. The problems in traffic congestion under these conditions may be imagined.

In connection with this we find that the tendency to overcrowding—and this in India is not based on economic grounds as in Europe, but on social ones. A given area is occupied by those of one religion, caste or trade, and owing to the contiguity of other castes or trades incompatible with the first, this area is unable to expand, and increased provision can only be made by packing houses closer on the ground.

Again the division of property among members of a family tends in the same direction; an equivalent to the share of a house cannot always be given, even if some members of the family are prepared to go elsewhere (often they are not), and what was once a good and suitable house is divided and re-divided so that it comes to be a convenient or healthy dwelling-place for but a couple of the count to look over, extensions are pushed at the back, and many rooms no longer get any light or air. Furthermore, housing of this type reacts on the national temperament. Being accustomed to overcrowding people no longer feel that repugnance to this mode of life, and offer less resistance to such tendency to overcrowd as is inevitable under economic pressure in that direction is not combated. Physique deteriorates, and rather than undertake a little extra exertion workers will pack themselves into inadequate accommodation because it is near their work or something indeed become near a cheerful locality.

This is not an exaggerated picture of the state of things as existing in many an Indian city, and, if this be the case, what remedy can be prescribed? Restrictions as to the number permitted to occupy premises of a certain capacity are easily drawn up but very difficult to enforce. The same may be said of by-laws restricting the amount of building on a given area, though these, like the enforcement of space about houses, are somewhat less difficult.

I am inclined to put more faith in the policy of providing a certain extension to the west of town, partly occupied building areas with every possible convenience of access and as near as possible to the congested districts—added to this it requires skilfully organised adjustments so that the various castes or trades shall not be violently uprooted, but rather offered some special inducement to remove, such as increased open space, or improved facilities in some form or other. Even then the problem is a difficult one, but there are signs of an increasing appreciation of the advantages of this type of solution, and the more frequently it succeeds the less will be the resistance that is met with in the future.

HOUSING.

New streets and open spaces are far more often required for the purpose of opening out overcrowded neighbourhoods than as provision for the needs of traffic, so that, desirable though a direct thoroughfare may often be, we have to be careful not to let the idea of this obsess us and lead us to adopt a scheme more extravagant than the actual needs of the case demand. It is always desirable to avoid the destruction of good-class property, and it is usually solely in the interests of traffic that such destruction may be contemplated, therefore the traffic need must be proved before this can be justified. If it be improved aëration and relief of overcrowding that is aimed at, we shall find that the "weeding out" of the worst type of dwelling will almost always answer the purpose.

It is extremely rare to find that wholesale demolition is a proper remedy, and it can only be advocated where this course will result in the substitution, for the same people who are dishoused, of a much higher class of dwelling. The measure has too often been adopted without any security for such a result.

In Europe it is a recognised duty that before removing a slum we shall see that the occupants have other convenient and superior houses to move to. Very few of the poorer people own houses, and the duty often devolves on the municipality of building new houses for these people, who rent them from the municipality at rents that must be fixed within their means.

Now in India the occupants of even the very smallest houses often own these, but it is none the less a duty to ensure that it is made easy for them to find new homes in suitable location in place of those to be removed.

The tendency towards overcrowding, for the reasons previously given, is more difficult to combat than in Europe, and it is more urgent that the authorities should not only make it possible for those dispossessed to find other homes, but should organise the removals and provide every facility in their power. Sometimes the payment of a proper monetary compensation has been regarded as discharging this duty, with the result that those householders deeply in debt (and many are in this unfortunate position) have been compelled to use this money to discharge their debts and find themselves with no longer a home and no means to provide a new one. Overcrowding thus becomes inevitable.

It is clear that if there is any risk of this municipalities must do more towards arranging for re-housing of those turned out than has hitherto been customary, though in all fairness I must admit that the attempt has frequently been made.

I may here explain what in my view is the best course for a municipality to take when expropriating householders under a clearance scheme. There are several alternatives. The immediate payment of cash compensation is, for reasons I have stated, often unwise. The provision of fresh sites and erection of new houses is rather a costly method if the new houses are, as they should be, much superior to those removed. In Europe it is possible to put up sanitary premises to be let at a suitable rent, but it is better that even the poor should own their houses when it is possible. Perhaps the best method is for the municipality to provide a new site, to allow so much of the old buildings as may be portable to be transferred and re-used, and then to pay out the amount allowed as compensation in instalments as the new house is erected. If the householder desires (and in this he should be encouraged) to build a better house, the municipality can lend a further sum, taking a mortgage on the house, this sum to be repayable by

* From a paper read at a meeting of the Town Planning Institute held on Friday last.

the householder in monthly instalments proportioned to the sum so advanced. In all cases the house to be built should be approved by the municipality, both as being good in itself and suited to the position of the owner.

This last course is, I consider, the one usually most likely to ensure the success of re-housing schemes where those to be re-located are possessed of but small means. Where they are comparatively well-to-do the problem is a simpler one, but it might still be as well to take such steps as will ensure the compensation paid being devoted to re-housing in an adequate manner.

TANKS.

The smaller Indian towns of the present day still maintain to some extent the organisations of the past, and illustrate both their merits and failures. In most cases a reasonably good site has been chosen with sufficient fall to carry off storm water, and with a supply of good water from wells or a clean tank on the higher part of the site. In a climate normally dry it was only necessary to obey the dictates of cleanliness to ensure healthy living.

Where there existed a good irrigation tank this was often retained for the purpose of water supply, usually deepened and revetted to ensure cleanliness, while other tanks at lower level provided accommodation for washing and bathing. As the supply areas of these tanks were gradually occupied, if they were not to be abandoned it was found necessary to supply them from other tanks at a higher level, and thus a tank system developed and answered its purpose until neglect allowed the water to become foul and useless.

If the site were on the banks of a good river, of course the problem of water supply was simplified; but here, as soon as a town grows to any size, it becomes impossible to avoid pollution, and the river ceases to be an admissible source of supply.

There is every excuse for reference to this question of water, in that it has been a fundamental one in the organisation of the Indian city. The habits of the people demanded a copious supply of water, while it was rare that costly engineering works would be undertaken to bring water from afar. With better facilities in this respect more latitude in the city structure is admissible, but it must not be forgotten that a tank system is also a provision for surface drainage during heavy rains, and as the town area no longer needs irrigation the tanks and their connections are needed in order to conduct the water from the upper to the lower margin of the town, where it can be utilised for agricultural purposes.

Apart from their value for washing purposes and equalising the temperature, tanks act as a safety valve in cases of sudden storms, and relieve the pressure on the connecting channels.

Thus an Indian city, properly organised, will always retain its tanks, and their abolition, though occasionally justifiable, is more often the result of lack of consideration, and distinctly prejudicial. So far our argument has been based solely on practical considerations, but we should on no account omit the support they receive from those of beauty. Everywhere water, either as a stream, river, lake, or tank, is a source of delight, and particularly is this the case in a hot climate.

WATER CARRIAGE.

The advantages of water carriage have not been by any means adequately exploited in Indian towns. In many where the situation lends itself admirably to the provision of a canal system, such a system is lacking, and even where canals have been made they are often neglected and not made the best use of as a means of transport. It may be contended that important existing canals in some cases fail to pay for their upkeep, but it must be remembered that a canal is of little value without a systematic linking up with factory, storage, and port areas. Ports like Calcutta and Cochin, placed on low-lying ground, would be greatly the better for an extended canal system such as we may find in the Netherlands, and there are numerous other coast towns where development on the same lines would be economically sound.

DRAINAGE.

A detailed discussion of drainage is beyond the scope of this paper, but there are certain features of this question, as it stands at present, that cannot be overlooked. India had in the past a definite sanitary system, perhaps ideally perfect for small communities, provided it was rigidly adhered to. Now neither of these conditions has been maintained. Even the large city of old days was more or less a series of groups with gardens and open spaces in between, quite unlike the closely packed towns of later centuries. Again, the discipline of strict observances has become relaxed, with the result that it is impossible to restore the old conditions in the larger cities of to-day.

There seem to be two alternatives. Where the city is definitely and irrevocably compacted together, there can be no other course than the adoption of European methods with such adaptations as can be made to meet national habits, and when everything practicable has been done in this direction to train the people to fall into line with the demands this system makes. At the same time we have to avoid building developments that necessitate the extension of sewerage systems, so that for so long as practicable there may be the alternative of the more traditional practices. The open lay-out of the garden suburb is of use in this respect, and if we can revive the old idea of the city as a group of villages it helps us. We cannot afford to introduce everywhere the costly systems demanded in Europe, neither will they benefit us unless the inhabitants are prepared to accept the change.

At the moment one cannot have any particular enthusiasm for this solution, as without far more definite general appreciation of the demands of good sanitation it is very difficult to ensure its working smoothly.

The second alternative is more on the lines of existing practice; with this, systematic and organised drainage may be classified under three heads—surface water, sullage, and soil. Everywhere there must be some definite courses through which rain water can be carried off roads and footways; as the volume of storm water fluctuates greatly these water-courses should be independent of all other drainage. For sullage or domestic waste water it is usually preferable to provide a channel system where the house compounds are too small to enable it to be used for cultivation and thus absorbed by plants. Cesspools in any form are to be avoided as objectionable. The removal of soil demands various expedients according to the habits of various classes of the community. Better class dwellings should be provided with receptacles, which can be exchanged, on collection, and carried to suitable depositing grounds or places for septic treatment. Public latrines, if permanent, should be similarly furnished, but it may be doubted whether the more primitive form of latrine provided with screens only should not be a movable structure frequently shifted and the site dug over. The provision of liberal space with some degree of privacy is a good expedient from the sanitary point of view, and often far safer than elaborate sewerage schemes.

At the meeting of the Town Planning Institute at which the foregoing paper was read, Mr. J. W. Cockrill (Great Yarmouth) presided. A vote of thanks was accorded to Mr. Lanchester on the proposition of Prof. Adshead, seconded by Mr. L. P. Cutlers.

On the motion of Mr. W. R. Davidge, seconded by Prof. Abercrombie, it was decided to place on record the appreciation of the Institute of the work of those engaged in India in promoting town planning.

Institution of Civil Engineers. At a meeting of the institution to be held on Tuesday next, at 5.30 p.m., the following papers will be submitted for discussion: "The Coolgardie Water Supply, Western Australia," by Percy Vincent O'Brien, M.Inst.C.E., and John Part, B.Sc., Assoc.M.Inst.C.E.; "Water Supply in the Interior of Western Australia," by Percy Vincent O'Brien, M.Inst.C.E.

London's Water Undertaking.—An idea of the vast character of the London water undertaking may be obtained from the recently published accounts of the Metropolitan Water Board. For acquiring the undertakings of the London Water Companies and some local services the Board were confronted with a capital expenditure exceeding £42,600,000. Extensions have since been carried out costing a further £3,393,000. The web of the Water Board's properties is so far-spread that rates and taxes paid in a single year amount to £464,000. Salaries, including superannuation, account for not more than £250,400. Pumping and [illegible] stirling per [illegible] The outgoings [illegible] mately still longer than the income, the [illegible] revenue [illegible] totalling £224,150.

Law Notes.

Edited by J. B. REIGNIER CONDER, Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

Drainage Contract—Alleged Misrepresentations Regarding Nature of Subsoil.—Mr. Justice Darling and a special jury were engaged in the King's Bench Division recently in the hearing of an action in which Mr. Kenneth Neal Monro, trading as Monro & Company, engineers and contractors, of Victoria-street, Westminster, claimed damage from the Bexley Urban Council in regard to a contract he entered into some time ago to construct certain sewage works for the council. Mr. Monro (the *Sussex Daily News* reports) based his claim on the allegation that he entered into the contract to do the work for £7,922 owing to certain misrepresentations made by the local agents as to the nature of the soil in which the work would have to be executed. He said he had gone to considerable expense, and had incurred loss to the extent of £1,973. Alternatively, he claimed rescission of the contract. In their defence the council denied any misrepresentation, and said if any statements were made about the soil, these did not induce Mr. Monro to enter into the contract. They admitted that the plaintiff did certain work, but a certificate of the engineer, they said, was a condition precedent to payment. They counter-claimed for £2,000 because the plaintiff had not completed the works. On behalf of the plaintiff it was stated that the alleged misrepresentations were in regard to the nature of the subsoil where the plaintiff was to place a large outfall tank, and his case would be that the officials of the council knew, or ought to have known, that, instead of clay being 18 ft. below the surface, it was some 33 ft. on an average, which meant a serious matter for the contractor. Replying to the Judge, counsel said plaintiff did not investigate for himself before commencing the work. For defendants it was argued that if a representation was made that clay on the site was believed to be 18 ft. down no particular part of the 6½-acre site was indicated. It was not really disputed that boring had taken place within that area, and it was for Mr. Monro, if he could, to show that in fact clay was not found at 18 ft. down. That burden he had not discharged. Even assuming there was carelessness on the part of anyone who made the statement, so long as he made it honestly, believing it to be true, counsel submitted that an action of this nature on an allegation of misrepresentation could not succeed. Mr. Justice Darling remarked that in his view there was no evidence that any representations were made fraudulently in the sense that those who made them knew they were false. Did they make them recklessly, not caring whether they were false or not? Mr. Monro was plainly told one borehole had been made; he did not make any objection. He was content to assume that the nature of the subsoil shown by that boring might reasonably be general through the site. That was itself a reasonable assumption if what was known to be true by those who made them there was certainly no evidence. Nor was there any justification for saying that there was anything amounting to a warranty by the council or their representatives as to the nature of the subsoil. The case must therefore be withdrawn from the jury, and judgment would be entered for the defendants on Mr. Monro's claim, with costs. The counter-claim by the council would be dismissed on the basis that the parties would arrange the matter as to the allowance of that. His lordship expressed the view that, with reference to the other point with which the jury had been invited to deal, the validity of the plea, and the contract was entered into in those circumstances. It was a case in which the parties could not have agreed upon terms limited to satisfy each other either on the basis of some sum with profit added or with a sum subtracted. If [illegible] the council would now ask their leave to withdraw their counter-claim. He had no power to [illegible] to do so, but it would be well [illegible] to pay costs, and probably [illegible] justice if they persisted in it.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. *The letter* X, *combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

Highway: Damage to Gas Main: Explosion.—"M. T." writes: In a street in an urban district there is a gas main belonging to the urban district council, laid at a depth of 2 ft. 4 in. The street was recently reformed, and a steam roller was used on it. Some hours after the work was finished an explosion of gas occurred in a house abutting on the street, damaging the house and its contents, and injuring one of the inmates. Subsequent investigation showed that the main had been broken across at the juncture of a service pipe. The damaged house is not installed with gas, and it is supposed that the gas, escaping from the broken main, permeated the subsoil and entered the house under the ground-floor level. Please state whether, in your opinion, the council are liable for damages. References to any cases in point will oblige.

The depth at which the main is laid appears to be sufficient to protect it from injury by ordinary traffic, and therefore, if the fracture was caused by the use of the steam roller, I think the council would be liable. If the fracture was due to some other cause, the question would arise whether there was any negligence on the part of the council, either in the original construction or in the maintenance of the main. If there was no negligence on this head, the further question would arise whether there was any failure to take reasonable precautions in connection with the use of the steam roller or for the prevention of any escape of gas. In a case of this kind, of course, everything depends on the view the judge and the jury (if any) may take of the facts as bearing on the question of negligence, but I think it is not at all unlikely that the council might be held liable. See *Gas Light and Coke Company* v. *St. Mary Abbots (Kensington) Vestry* (49 J.P., 469); *Driscoll* v. *Poplar District Board* (62 J.P., 40).

The Re-sewering of Private Streets.—"R. S. P." writes: About ten years ago an estate in this district was laid out for building. Several roads were formed, and sewers were laid therein by the landowner. Houses were from time to time erected, fronting the roads, the drains from such houses being connected with the sewers. The roads have not been taken over by the council. Several of the sewers have now got into a very bad state of repair, and the council are considering the advisability of totally reconstructing their drainage system. Will you please advise me whether, under Section 150 of the Public Health Act, or under any other enactment, the council can compel the frontages to bear the expense of laying new sewers in the roads?

In my opinion, assuming that the sewers were properly constructed, and sufficient, at the time of their construction, for the purpose for which they were made, the frontagers cannot be charged with the expense of re-sewering the roads in question. See *Bonella* v. *Twickenham Local Board* (52 J.P., 356).

Water Supply: Entry on Premises.—"Water" writes:—Arising out of a report of the medical officer of health to an urban district council as to the desirability of all dairies, butchers', and other premises being connected with the public water supply, the council directed that samples of water should be taken for analysis from any wells supplying water to such premises, and if found contaminated, the wells to be closed. If entry to any premises for the purpose of taking a sample of water be refused, is the procedure under Sec. 102 of the Public Health Act, 1875, *re* order of Justices, the right one for the purpose? If not, how can the sample be obtained?

Assuming that the council have been invested by Order of the Local Government Board with the powers given by sec. 7 of the Public Health (Water) Act, 1878, then unless the Order otherwise provides the procedure, in the event of admission to any premises being refused, would be under sec. 102 of the Public Health Act, 1875, for a magistrate's order; and if the refusal is persisted in after such an order has been made, the offender will be liable, under sec. 103, to a penalty not exceeding £5.

SURVEYOR TO LOCAL AUTHORITY: EFFECT OF BANKRUPTCY.—"X. Y. Z." writes: During these hard times and rapidly increasing cost of living, many surveyors who have not had their salaries correspondingly increased will have a difficult job to make both ends meet, and no doubt some will get into financial difficulties. How does a surveyor fare under such circumstances? Should he be declared a bankrupt? Does he, *ipso facto*, lose his appointment, or become disqualified in any way from holding office? I am told there is nothing in the Public Health Act, 1875, or the Bankruptcy Acts concerning public officials becoming bankrupt? Is this so?

There does not appear to be any provision either in the Public Health Act, 1875, or in the Bankruptcy Acts terminating the appointment of a surveyor to a local authority on his being adjudged bankrupt.

NUISANCE: "OVERCROWDING."—"Ivanhoe" writes:—Can you please give the definition of the above word—*i.e.*, minimum cubic space per head for adults; ditto children? I presume any prosecution for statement would be taken under Sec. 91 Public Health Act, 1875.

There is no statutory definition of overcrowding. It is a question of fact in each particular case whether premises are (in the words of sec. 91 of the Public Health Act, 1875) "so overcrowded as to be dangerous or injurious to the health of the inmates." A report by the medical officer of health that such is the case would no doubt be *primâ facie* evidence thereof. Before proceedings are taken, notice to abate the nuisance within a specified time must be served on the person by whose act default or sufferance it arises or continues, or, if he cannot be found, on the owner or occupier of the premises, under sec. 94. If he fails to do so, proceedings can be taken under sec. 95.

CONVERSION OF HOUSE REFUSE INTO FUEL.

THE SOUTHALL-NORWOOD COUNCIL'S APPLICATION.

In the House of Commons, on the 22nd inst., the Secretary to the Local Government Board was asked whether the board's refusal to grant the application of the Southall-Norwood Urban District Council to put down a plant for the conversion of the house refuse into fuel was because the board was not aware of any statutory authority for the proposal; and, if so, whether the board would state what additional authority was required by them?

Mr. Hayes Fisher, in reply, said that, as he stated in his answer to a question on the 8th inst. [see THE SURVEYOR, March 16th, p. 286], there were other considerations which affected this matter.

CAMP WASTE.

On the same day the Minister of Munitions was asked whether he was aware that the inclusion of foodstuff in the method of conversion of camp waste into fuel was not necessary for the process; and whether he would cause investigations to be made into this matter with the view of a correct statement being made.

The Parliamentary Secretary to the Ministry of Munitions (MR. KELLAWAY) said that if any evidence was submitted to him as to the possibility of adopting any such process for the conversion of camp refuse into fuel which did not involve the treatment of food refuse, he would be happy to cause it to be investigated.

"AN IMPORTANT ECONOMY IN FUEL."

In our issue of the 23rd inst. there appeared under the above heading a short article in which it was explained how the coal dust in our cellars could be easily converted into a useful fuel. Unfortunately, there occurred two printer's errors which require correction. In describing the proportions of the cement and coal dust the word "pints" was printed, whereas it should have been "parts"; and in describing how a flower-pot could be used as a mould, and how the "dough" could be turned out at once by inverting the "pot," the word "box" was used instead of pot—which must have sorely puzzled the readers of the article. We may add that those who would like to have full particulars of how these cheap and useful briquettes can be made at home without any plant or capital can obtain a small leaflet giving them all the required information on application to the Concrete Publicity Bureau, 6 Lloyds-avenue, E.C. 3.

Next week's "Surveyor" will be published on Thursday, April 5th, and all news and advertisement matter should therefore reach us not later than Wednesday morning, April 4th.

SOME RECENT PUBLICATIONS.*

LAXTON'S BUILDERS' PRICE BOOK FOR 1917. Price 4s. London: Kelly's Directories, Ltd.

The present is the hundredth successive annual edition of this indispensable work. "Laxton's" has, of course, long been recognised as the standard book on prices in the building trades, not only by the public generally, but also in courts of law, where its pages are frequently made the subject of reference. The arrangement of the book has not been in any way altered this year, but for the first time a new feature has been introduced in the present edition in the shape of a list of "specialities" extending over thirty closely-printed pages. This new feature should be of much service to those requiring to be able to at once trace the firms by whom the "specialities" used in the building trades are manufactured. The list gives facilities for at once tracing the names and addresses of the manufacturers of over one thousand such specialities, though, of course, it does not profess to be absolutely complete. It is, however, hoped to make it more and more complete year by year, and we have very little doubt that it will be found of the greatest possible service to all interested in the building trades, and particularly, of course, to those who are engaged in planning buildings and to quantity surveyors and others engaged on estimating work. So far as we know, there is no book in which any similar list has ever been attempted.

MANUAL OF REINFORCED CONCRETE. By Charles F. Marsh, M.INST.C.E., and William Dunn, F.R.I.B.A. Price 10s. 6d. nett. London: Constable and Co.

The third edition of this well-known book has practically been rewritten, and it therefore gives the latest and most up-to-date information on this important subject. Reinforced concrete now plays so large a part in constructional work that the rule-of-thumb methods in vogue until recently with so many architects and engineers can no longer be permitted. If bad or wasteful work is to be avoided, more scientific methods are necessary, and this book deals with the use of reinforced concrete in a sufficiently comprehensive manner, and at the same time in such a convenient and useful form, as to cover all ordinary requirements.

The book has a wide range, and while it deals very fully with the theoretical side of the subject, the authors' great experience in this form of construction enables them to give much sound and practical advice with regard to its use and properties. It is a book that should find a place in every engineer and architect's library, and is a work that no municipal engineer can afford to be without.

MUNICIPAL EMPLOYEES AND NATIONAL SERVICE.

At a meeting recently of the Bristol Sanitary Committee, reference was made in the report of the Works Sub-Committee to the question whether employees should enrol under the National Service scheme. It was stated that in the Bristol city engineer's department every man who could be spared had gone on military service. If the remainder enrolled they would not be available for National Service. Therefore, it was merely waste of time for them to enrol. The sub-committee recommended that men who liked to volunteer for National Service should be free to do so, and that their positions should be kept open for them, but this was to apply only to men in the employment of the committee before the war broke out. The report was adopted.

At the meeting of the Egham Urban District Council the General Purposes Committee recommended that the council's officials and employees be allowed to enrol for National Service, but that it be pointed out that the officials are single-handed in their respective departments, and are already doing important national work. This was amended by a subsequent resolution that each official should use his own discretion as to enrolling.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

Municipal Work In Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Bristol T.C.—The city engineer, Mr. L. S. McKenzie, has been instructed to report upon the question of police cottages in immediate proximity to the Colston Girls' School.

Shipley U.D.C. An arrangement had been made for the purchase by the council of the Somerset House estate. Somerset House has been used as the council's offices since the Manor House was dismantled preparatory to the building of new offices, a scheme which was suspended on the outbreak of the war.

Willesden U.D.C. The Public Health Committee have been asked to go into the question of providing additional sanitary conveniences.

HOUSING AND TOWN PLANNING.

Holmfirth U.D.C. The council contemplate the erection of twenty working class houses at an estimated cost of £6,000.

Hunslet R.D.C.—It is notified that the rural district council intend to apply for authority to prepare a town-planning scheme in respect of lands within their area and partly within the districts of Rothwell and Methley.

Longbenton U.D.C. The council are to consider shortly the purchase of a site for workmen's houses.

MOTOR TRANSPORT.

Baildon U.D.C.—The council have acceded to the request of the Wharfedale Hospital Board for the provision of a motor ambulance for £600. Baildon's share of the cost is to be £57.

Bradford T.C. The Electricity Committee have agreed to purchase two electric five-ton chassis and one petrol 25-cwt. tipping wagon.

Marylebone B.C.—The council are recommended to accept the tender of the Austin Motor Company, Ltd., for the supply of six motor lorries for dust collection, at £745 each.

Newton-in-Makerfield T.C. The town council are considering the purchase of a light motor lorry.

Ripon R.D.C.—The council are making another appeal to the Local Government Board to sanction a loan jointly with the Ripon City Council for the purchase of a motor fire-engine, the present engine belonging to the latter authority having been damaged beyond repair by the military authorities.

REFUSE COLLECTION AND DISPOSAL.

Dublin T.C.—The Cleansing Committee report that [illegible] paper we every week throwaway over the [illegible] manage to general city refuse, merely because the public will not take the trouble to put the [illegible] into sacks. Once the paper is put into the dustbin it becomes so mixed up with domestic refuse that it is to a great extent useless. The committee last year undertook to leave sacks for the collection of paper and sell for them. The amount received from the sale of waste did not leave much profit after the expenses of collection had been met, but a substantial outlay was obtained for manufacturing purposes. After a time the quantity of waste collected fell away considerably, and the amount received in the sacks is now very small.

Edinburgh T.C. Mr. Stark, convener of the Cleansing and Lighting Committee, said he wanted to impress upon the citizens the necessity of helping the work of the department by consuming as much waste as possible in their houses by their own fires, and to save waste paper wherever possible. It was increasingly difficult for the Cleansing and Lighting Department to cope with the work of keeping the city clean. The number of men in the employment of the department at the end of that month was 537 less than the number at the outbreak of war. The number of horses had been reduced from 170 to 84. [illegible] as the present time [illegible] being largely carried on by men who had not been accustomed to the duties. Citizens were disposed to overlook the great saving which would result from a rigid adherence to the policy of consuming everything that was capable of being burned (except paper) in the fireplace of the house. Thousands of pounds yearly could be saved if only the ratepayers realised how easily they might lessen the expense by curtailing the output of waste. Clean paper should be saved in the national interests. The department supplied bags and collected the paper regularly. There were 8,453 bags loaned out at this moment, and the department was selling over sixty tons of paper every month.

Lambeth B.C.—Having regard to the dangers arising from any accumulation of refuse during warm weather the council have voted in support of a request that the Local Government Board insist upon the inclusion of workmen engaged in the clearing of house refuse among the reserved occupations which are in the national interest.

ROADS AND MATERIALS.

Abergele U.D.C.—Negotiations are pending for the purchase of property for the widening of Chapel-street.

Barrowford U.D.C. The council are advised to apply for sanction to a loan of £1,500 for the widening of Colne-road.

Bristol T.C. Reference was made at the meeting of the Sanitary Committee to the bad condition of Avonmouth-road owing to the amount of exceptional traffic and the effects of frost. The Government representatives were anxious the subject should be dealt with, but it was pointed out that there were serious difficulties owing to the inability to get delivery of hard stone, and to other causes. A scheme had been suggested under which the State would assist in regard to the provision and transit of materials, in meeting part of the cost, and facilitating the raising of money for the remainder of the bill. The expense was estimated at £8,000, and the committee gave conditional approval to the scheme. The Road Board will be asked to grant £5,000 towards the outlay.

Ballymoney R.D.C.—The Local Government Board have sanctioned the increase of the limit of expenditure of the council to £9,500. The council have agreed to a direct labour scheme for the maintenance of the roads in Aghalee.

Cavan R.D.C.—The Local Government Board have written sanctioning the permanent increase of road expenditure to £10,000.

Chirbury (Salop) R.D.C. It has been agreed, on the application of Montgomery County Council, to permit the surveyor (Mr. W. P. Hole) to give certificates as to the proper maintenance and construction of main roads and the work of tar macadamising carried out during the present year, and to continue that service as long as the post of the county surveyor remains vacant, providing the duties did not interfere with those he had to discharge for the district council.

Holmfirth U.D.C.—Proposals for the widening of Towngate at an estimated cost of £7,000 are being considered.

Norfolk C.C.—The county surveyor, Mr. W. W. Gladwell, reported to the Western Highways Committee that applications had been received from roadmen all over the district asking for an increase of wages so as to bring them into line with the agricultural labourers. The wages now being paid to the farm workers was 25s. per week. The roadmen worked nine hours a day for nine months in the year, and eight hours a day for the other three months. Mr. H. Kerkham stated that with the increase of wages the agricultural labourers had to work an extra hour a day. Would the roadmen work another hour if they got the same wages? The county surveyor said that was under trial and they were agreeable. Mr. H. A. Day pointed out that the question of the agricultural labourer's wages were just now a matter of arbitration. If they were granted more than 25s. per week, would

a similar increase to the roadmen follow? The chairman said that would be so. It was decided to grant the increase asked for, subject to any decision that might be come to in respect to the wages paid to agricultural labourers.

Westmorland C.C.—The council are making application to the Road Board for a grant of £400 for tar-spraying.

SEWERAGE AND SEWAGE DISPOSAL.

Hartismere R.D.C.—It has been agreed to continue the piping of the sewer to the sewage farm at Diss at an estimated cost of £100.

Hendon R.D.C.—Mr. R. H. Bicknell, M.INST.C.E., consulting engineer, of 16, Victoria-street, has been called in by the Hendon Rural District Council to advise and report on a scheme prepared by the surveyor (Mr. James A. Webb) for the extension of the sewerage system and the construction of new purification works for the parish of Harrow Weald.

Luton T.C.—The Sewage Committee recommend the construction of a 12-in. water surface pipe sewer at an estimated cost of £230.

WATER, GAS, AND ELECTRICITY.

Bootle T.C.—The nett surplus on the electricity undertaking for the past year will amount to approximately £3,268, though no surplus was estimated for.

Bradford T.C.—The electrical engineer has been asked to proceed with the laying of the new cooling tower foundations at the electricity works, and to submit a scheme for additional cooling towers.

Chorley R.D.C.—It is proposed to provide a water supply for Adlington.

Cork T.C.—Explaining to the Works Committee the estimate for public lighting for the ensuing year (£7,800, an increase of £750 upon the preceding year), the city engineer, Mr. J. F. Delaney, stated that but for the extinguishing of about 300 lights in different wards last year the figure in this year's estimate would have been £9,149. The saving of approximately £1,500 had been effected. There was an increase of 33 per cent in the cost of gas and 10 per cent in that of electric light. The city engineer was complimented on the way he had economised. The amount was passed.

Lambeth B.C.—The borough council have given their support to a recommendation from the borough of Deptford to dispense with street lighting during the months of May, June and July, except in places which require special treatment.

Londonderry T.C.—A decision has been reached to promote a Parliamentary Bill for obtaining a water supply from Banagher Glen and Lurnapeastia. The scheme was prepared by the city engineer, Mr. M. A. Robinson, and it has been favourably reported upon by Messrs. Swiney and Croasdaile.

Morecambe T.C.—The council are considering a scheme involving an expenditure of £6,000 upon the development of the electricity works.

Motherwell T.C.—A sub-committee have reported in favour of considerable extensions of the electricity undertaking at an estimated cost of £30,000.

Rochdale T.C.—The Electricity Committee have reported favourably upon the adoption of the scheme of extensions at the electricity works recommended by Mr. W. J. H. Wood, the borough electrical engineer for Bolton, who was appointed consultant. The estimated cost of the proposals is £20,000.

Twickenham U.D.C.—Subject to the approval of the Commissioner of Police, and to such exemptions in special cases as the surveyor may consider necessary, it has been decided that the whole of the street lamps in the side streets shall be left unlighted during the period of summer time.

MISCELLANEOUS.

Bootle T.C.—The approximate deficit for the past year on the tramways undertaking will be £2,822, against £1,811 estimated, an increased deficit of £1,011. The whole of the deficit will be met out of the reserve fund.

Hailsham R.D.C.—Owing to the increased price of petrol and the enhanced railway fares the surveyor, Mr. G. B. Fairchild, has been granted a bonus of £10 for the half-year ending March 31st, making £20 for the whole year ending on that date.

Bristol T.C.—The city engineer, Mr. L. S. McKenzie, has submitted a report on the collection by ash collectors of waste food from houses for use in pig feeding. The suggestion that the works department should utilise this food by establishing a municipal piggery had brought an offer of a yard from a Bedminster firm. The reply sent was that the space was not at present required, but that later on the Works Committee might be glad to avail themselves of the offer.

Paignton U.D.C.—A tender of £140 for fencing Roundham Head with patent expanded metal fencing has been accepted by the Pleasure Grounds Committee.

St. Ives T.C.—The borough surveyor, Mr. S. Palmer, has received instructions to repair temporarily the front of Smeaton's Pier, and to prepare an estimate of the cost of an apron 30 ft. in length.

PERSONAL.

Mr. H. Gibbon, surveyor to the Axminster Urban District Council, has resigned.

Mr. H. C. J. Edwards, borough engineer of Lambeth, who has been suffering from overwork, has been granted three months' leave of absence.

Mr. E. Lailey, surveyor to the Watford Rural District Council, has had his salary increased from £400 to £450 for the year ending March 31, 1918.

Mr. L. Holme Lewis, waterworks engineer to the Manchester Corporation, has had his salary increased from £850 to £950 per annum.

Mr. John Stansfield Brim, of Bradford-on-Avon, has been appointed surveyor and sanitary inspector to the Darfield Urban District Council.

Mr. Arnold Morris, ASSOC.M.INST.C.E., borough engineer's office, Huddersfield, has been elected a member of the Royal Sanitary Institute.

Mr. Charles Hinchliffe, of Slaithwaite, has been appointed surveyor to the Penistone Urban District Council, in succession to the late Mr. J. Swift.

Mr. A. R. Tuddenham, sanitary surveyor to the Erpingham Rural District Council, has been voted £25 for special work in connection with the erection of an isolation hospital.

Mr. F. H. Gibbons, assistant borough engineer, Dudley, has received a commission as a technical engineering officer, and will be attached for duty to the Devonshire Regiment.

Mr. Arthur Parker, engineer and surveyor to the Oakham Urban District Council, has accepted a commission as regimental technical officer, attached to the Durham Light Infantry.

Mr. W. A. Lavender, surveyor to the Swaffham Rural District Council, has received a commission as technical officer to Regimental Labour Units, and is attached for duty to the Durham Light Infantry.

Mr. A. R. Cameron, surveyor to the Thingoe Rural District Council, has resigned his appointment and joined the Army. Mr. R. G. Saint, inspector of nuisances, will carry out the surveyor's duties in the Thingoe district during the war.

Mr. S. A. Manning, who has been appointed acting surveyor to the Newmarket Urban District Council in the absence of Mr. W. H. Eley with a Works Battalion of the Devon Regiment, has agreed to accept a remuneration of three guineas per week, the chairman of the council, Mr. H. Holland, J.P., remarking that in this way Mr. Manning was rendering national service.

Mr. J. H. Walters, borough surveyor of Congleton, has been offered a commission in the Army by the Director of Railways and Roads as a technical officer, but the town council have passed a resolution stating that they consider the services of Mr. Walters in connection with the water, sewerage and sanitary departments of the corporation to be indispensable, and that it is in the national interest that he should continue in his present position instead of accepting the offer.

Mr. Joseph M[illegible], who was appointed temporary surveyor to the Oswestry Rural District Council in the absence on service of Mr. Harold Davies, the surveyor, has declined to accept the post at the salary offered him, viz., at the rate of £125 a year, and Mr.

Richards, sanitary inspector, has consented to act as surveyor at an additional salary of £60. Though Mr. Davies did not apply for an allowance while he is on service, the chairman of the council (Mr. N. W. Willthew) stated that it had been agreed to pay him £1 a week during his absence. In addition to being a good servant, Mr. Willthew added, Mr. Davies had treated the council very well in the matter. In consideration of not having had a vacation during the last two years, Mr. Davies has been voted an honorarium of £20.

OBITUARY.

Mr. John W. Baxter, road surveyor to the Upper Ward of Lanarkshire District Council, died suddenly last week, we regret to state, aged sixty-seven. He was an architect by profession. In 1878 he became road surveyor to the Lanark and Hamilton Turnpike Road Trust, and in 1896 he was appointed road surveyor for the whole of the Upper Ward of Lanark.

The late Mr. Baldwin Latham, the *Beckenham Advertiser* states, could justly be styled the prophet of the Bourne, that mysterious stream which starts at Caterham and makes its appearance at more or less regular intervals at Riddlesdown and Coulsdon. At one time an object of superstition, Mr. Baldwin Latham, by careful study and investigation, showed that its rise and fall was entirely due to natural sources, and he could predict its appearance to a day, almost to an hour.

The Late Mr. Gibson Thompson.

I was very sorry to hear of the death of Mr. Gibson Thompson, the founder of the journal which is of such service to engineers and surveyors to local authorities. I did not know Mr. Thompson personally, but one cannot read a journal for twenty-five years without knowing something of the spirit of the editor, and I feel a sense of loss—the loss of a friend.—Mr. Herbert G. Coates, engineer and surveyor to the Market Harborough Urban District Council.

I am very sorry to hear of Mr. Gibson Thompson's death, though my last meeting with him somewhat prepared me for it. I had known him well over twenty years, and as a younger man I always looked forward to having a long talk with him at the annual or other meetings of the Institution of Municipal Engineers and the Water Engineers' meetings. I always had a very high regard for his literary and technical abilities, and feel very grateful for the practical and sympathetic advice he freely gave me. He had every reason to be proud of the improvements he made in The Surveyor—improvements which have made it indispensable to every municipal engineer who wishes to be up to date in his profession. —Mr. Arthur J. Price, engineer and surveyor to the Lytham Urban District Council.

Mr. Thompson had an engaging personality, and was at one time—before the commencement of his long illness—a strong force in the counsels of municipal engineering. He was always a friendly, if outspoken, critic of the profession for which he catered, and he kept his paper clean and free from those "dark" influences with which most journalists are familiar.—*Municipal Journal.*

Mr. Thompson was a man who had many friends but few enemies.—*Municipal Engineering and Sanitary Record.*

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRY HELD.

Coulsdon and Purley U.D.C. (March 20th. Mr. P. M. Crosthwaite). £3,350 for drainage extension at Coulsdon. The clerk, Mr. E. J. Gowen, stated that one proposed extension was for Chipstead Valley-road, to connect eighty-eight houses, besides property to be built. The other extension would be in Riddlesdown-road. The acting surveyor, Mr. A. Clark, explained the proposals in detail.

APPLICATION FOR LOAN.

Ilford U.D.C. £10,000 for the utilisation of steam at the refuse destructor for electricity purposes.

FORTHCOMING INQUIRY.

APRIL.

3. **Abingdon.** For the purchase of land for sewage disposal purposes (Mr. A. G. Dewey).

FOR OTHER ADVERTISEMENTS

See End of Paper.

ASHTON - UPON - MERSEY URBAN DISTRICT COUNCIL.

APPOINTMENT OF (TEMPORARY) SURVEYOR AND SANITARY INSPECTOR.

The above-named Council invite applications for the appointment of Surveyor and Sanitary Inspector, subject to one month's notice on either side. Applicants must be ineligible for military service, and have efficient knowledge of sanitary matters, sewage works, maintenance of roads, &c., and be competent to carry out the duties appertaining to the respective offices.

He will be required to commence duties immediately.

Applications, endorsed "Surveyor," stating age, experience, qualifications, and salary required, accompanied by copies of three testimonials of recent date, to be sent to the undersigned on or before Tuesday, April 10th.

J. W. L. FOULKES,
Clerk to the Council.

Council Offices,
Ashton-upon-Mersey
March 30, 1917. (3,374)

WANTAGE RURAL DISTRICT COUNCIL.

TEMPORARY INSPECTOR OF NUISANCES.

The above Council invite applications for the appointment of a properly qualified person to act as Temporary Inspector of Nuisances for the whole of their District, during the absence of the Inspector on military service.

The area of the district is 74,500 acres, and the population at the last census was 12,028.

Candidates must be ineligible for military or naval service, and possess the Certificate of the Royal Sanitary Institute or other similar examining body. The person appointed will be required to devote the whole of his time to the duties. The salary will be £160 per annum, out of which he will be required to keep a motor bicycle for the purpose of travelling about the district, and the appointment will be subject to the sanction of the Local Government Board, and terminated by three months' notice on either side.

The duties will be those prescribed by the Local Government Board's Order of the 23rd March, 1891, and any other duties which the person appointed may be called upon to discharge under the Public Health Acts applicable to the office. He will also be required to act as Inspector under the Factory and Workshops Acts, the Dairies, Cowsheds and Milkshops Order, and all other by-laws both now and in future in force in the district, and generally to obey all the instructions of the Council and their Medical Officer of Health.

Applications, in candidate's own handwriting, stating age, present and previous employment, with copies of not more than three testimonials of recent date, to be sent to the undersigned not later than the 9th day of April, 1917.

Canvassing, directly or indirectly, will be deemed a disqualification.

(By order of the Council)
EDWD. B. ORMOND,
Clerk.

Wantage.
March 28, 1917. (3,373)

COUNTY BOROUGH OF BOOTLE.

TEMPORARY ENGINEERING AND SURVEYING ASSISTANT.

Applications are invited by the Bootle Corporation for the appointment of a Temporary Assistant (who must be ineligible for military service) in the Borough Engineer's Department. Applicant must be good draughtsman, with a thorough knowledge of surveying and levelling, and preference will be given to one who has had experience in a Municipal Office. Salary £2 per week, with war bonus.

Applications, stating age, experience and qualifications, together with three recent testimonials, and stating the earliest date on which the applicant could take up his duties, if appointed, must be delivered to the undersigned on or before Wednesday, 11th April, 1917.

B. J. WOLFENDEN,
Borough Engineer and Surveyor.

Town Hall, Bootle. (3,373)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. John S. Brodie, M.Inst.C.E., Borough Engineer and Surveyor, Blackpool.

NORTH-EASTERN DISTRICT.

A North-Eastern District meeting of the Institution of Municipal and County Engineers will be held at Spenborough to-morrow (Saturday), the 31st inst.

Programme.

2.30 p.m.—Meet at the offices of the Spenborough District Council, Town Hall, Cleckheaton, where the members will be welcomed by Councillor J. H. Collier, J.P., chairman of the council.

Short paper, entitled "A Few Notes on the Duties of a Surveyor," by Mr. A. Rothera (member), surveyor to the Spenborough District Council.

Business:

To report receipt of letter from Mr. O. Claude Robson, in reference to the Orphan Fund and the action of the executive committee thereon.

To consider the election of district representatives on the council, district chairman and district secretary for the ensuing year.

To make arrangements for future meetings.

5 p.m.—Tea at the town hall after the meeting, by the kind invitation of the chairman of the council (Councillor Collier, J.P.).

W. E. H. Burton, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Wakefield.

EASTERN DISTRICT.

An Eastern District meeting is to be held at the Council House, Hounslow, to-morrow (Saturday).

Programme.

2.15 p.m.—Assemble at Council House, Hounslow, where the members will be welcomed by the chairman of the council, Mr. A. A. Bergin, J.P.

1. Read and confirm minutes of previous meeting.

2. To consider nominations for—(*a*) District chairman; (*b*) district representatives to the council; (*c*) district honorary secretary.

3. To elect district executive committee for year ending 1917-18.

4. To make arrangements for spring and summer meetings.

5. To consider circular from Mr. O. Claude Robson in reference to the Orphan Fund.

6. General business.

Discussion of a paper by Mr. J. G. Carey, Assoc.M.Inst.C.E., engineer and surveyor, Heston and Isleworth Urban District Council, on "Some Notes on Municipal Works at Heston and Isleworth."

3 p.m.—Visit the Aerodrome, Hounslow Heath, by kind permission of the military authorities.

3.45 p.m.—Inspect experimental section of clinker and asphalt road, Staines-road.

Inspect Alexandra Schools, Hounslow.

Inspect electricity and refuse destructor works, Bridge-road, Hounslow.

5.15 p.m.—Return to Council House to tea, kindly provided by Mr. Carey.

Percival T. Harrison, Assoc.M.Inst.C.E.,
Hon. District Secretary.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Edward Whitwell, F.I.S.E., M.S.A., Engineer and Surveyor, Abersychan Urban District Council.

EASTERN AND NORTH-EASTERN DISTRICTS.

An Eastern and North-Eastern District meeting of the Institution of Municipal Engineers will be held at Peterborough on Wednesday, April 18th.

Programme.

12 noon.—Meet at City of Peterborough Electricity Generating Station, and inspect works, by kind permission of the engineer.

1 p.m.—Adjourn for lunch.

2 p.m.—Visit to Messrs. Barford & Perkins, Limited, Engineering Works, by kind permission of Mr. J. G. Barford.

Visit to City Museum if time allows.

4 p.m.—District meeting at Swiss Cafe, Narrow-street, when a paper, "Experiences in a Fen Rural District," will be read by Mr. A. W. Broker, district chairman.

Tea.

G. Belson Chilvers,
Hon. District Secretary.

Oundle, Northants.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

"Engineering News Record."—The interesting announcement is made that, with the object of rendering a broader and better service to the profession in whose interests they are published, the two leading American engineering journals, *Engineering Record* and *Engineering News*, will be consolidated next month into *Engineering News Record*. Both the *Record* and *News* have, in their separate capacities, rendered inestimable service to engineers and engineering in the past, and, combined, may be expected to prove of even greater usefulness to the profession in the future. We offer our heartiest wishes for the success of *Engineering News Record*.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR.—April 2nd.—Faringdon Rural District Council. £120 a year.—Mr. A. G. Haines, clerk, Faringdon, Berks.

DIVISIONAL SURVEYOR.—April 7th.—Middlesex County Council. £300—£350.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster, S.W.

SURVEYOR.—April 8th.—Elland Urban District Council.—Mr. J. Clarkson, clerk, Council Offices, Elland.

BOROUGH ENGINEER'S CLERK.—April 8th.—Borough of Royal Leamington Spa. £2 per week.—Mr. John J. Kennan, borough engineer, Town Hall, Leamington Spa.

BUILDING INSPECTOR.—April 10th.—Corporation of Bootle. £120 per annum, plus war bonus.—Borough Engineer, Town Hall, Bootle.

TRAMWAYS TRAFFIC SUPERINTENDENT.—April 23rd.—London County Council. £500 to £700 a year.—The Clerk, London County Council, Spring-gardens, S.W.

ELECTRICAL ENGINEER.—April 23rd.—London County Council. £1,200 to £1,500 a year.—The Clerk, London County Council, Spring-gardens, S.W.

MUNICIPAL ENGINEER.—May 1st.—Municipality of Lahore, India. £1,000—£1,600 per annum.—Mr. H. P. Tollinton, deputy commissioner and president, Municipal Committee, Lahore.

TRAMWAYS DEVELOPMENT SUPERINTENDENT.—May 7th.—London County Council. £500 to £800 a year.—The clerk, London County Council, Spring-gardens, S.W.

ROLLER DRIVER.—Ripon Rural District Council. 36s. per week.—Mr. J. W. Plewes, 6 Firs-avenue, Ripon, Yorks.

ASSISTANT SURVEYOR'S OFFICE.—Ulverston Urban District Council.—Mr C. Telford Hague, surveyor, Town Hall, Ulverston.

ASSISTANT ENGINEER—Public Works Department, Nigeria. £300-£400 a year.—Crown Agents for the Colonies, 4, Millbank, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

CORK.—April 2nd.—For the erection of a school.—Ballingeary R.I.C. Barrack, and the District Office of Works, Cork.

DEWSBURY.—April 2nd.—For the construction of water-closets at outbuildings, for the corporation.—The Borough Surveyor, Town Hall.

KIRKCALDY.—April 3rd.—For the execution of alterations at the gasworks for the corporation.—Mr. J. Kincaid, Gas Office, Kirkcaldy.

ABERDEEN.—April 5th.—For the erection of a sub-station, for the electricity department.—Mr. J. A. Bell, city electrical engineer, Millburn-street, Aberdeen.

DOWNPATRICK.—April 7th.—For rebuilding sea-walls and subsidiary works.—County Surveyor's Office, Courthouse, Downpatrick.

Engineering: Iron and Steel.

HORNSEY.—April 2nd.—For the supply of new sectional cast-iron heating boilers, with piping, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor, Town Hall, Highgate.

MANCHESTER.—April 3rd.—For the supply of a turbo-alternator and condensing plant, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall.

SALFORD.—April 9th.—For the supply of mild-steel trays for coal elevator, for the electricity department.—Borough Electrical Engineer, Frederick-road, Salford.

WARRINGTON.—April 11th.—For the supply of one 3,000-kw. turbo-alternator, and surface condensing plant, for the corporation.—Mr. F. V. L. Mathias, borough electrical and tramways engineer, Howley, Warrington.

HULL.—April 12th.—For cooling towers required in connection with extensions at the generating works, for the corporation.—Mr. J. F. Magoris, acting city electrical engineer, Electricity Works, Sculcoates-lane, Hull.

MANCHESTER.—April 12th.—For the construction of a reinforced concrete waste-water tank, for the Gas Committee.—Mr. F. A. Price, superintendent, Gas Department, Town Hall.

ST. PANCRAS.—April 12th.—For the supply of lamp carbons, for the borough council.—The Electricity Department, 57 Pratt-street, Camden Town, N.W.

GREATER WINNIPEG.—April 12th.—For the supply of 12,000 ft. of 48-in. and 1,300 ft. of 60-in. cast-iron pipes, with specials, for the commissioner.—Mr. R. D. Waugh, chairman, 501 Tribune-buildings, Winnipeg, Man., Canada.

TEWKESBURY.—April 14th.—For the supply of a small portable baling press, with wheels, for baling waste paper, for the corporation.—Borough Surveyor, Tewkesbury.

Roads.

BILLERICAY.—April 2nd.—For the supply of granite, Kentish rag, Kentish flints, gravel, screenings and sand, carting and hire of horse and man, for the rural district council.—Mr. F. E. Ennals, Shelley-road, Hutton, and Mr. R. J. W. Layland, Billericay.

MELTON MOWBRAY.—April 2nd.—For asphalting and repairing footpaths, for the rural district council.—Mr. G. E. Fryer, surveyor, Wyndham-avenue, Melton Mowbray.

HEBBURN.—April 2nd.—For tar-spraying the district roads, for the urban district council.—Mr. H. Lee, jun., deputy surveyor, Council Offices, Argyle-street, Hebburn.

HUNSLET.—April 3rd.—For steam and road rolling and scarifying, for the rural district council.—Mr. W. B. Poplar (clerk), Lockwood, Hunslet, Leeds.

ALDERSHOT.—April 3rd.—For the supply of 410 tons of slag Tarmac, 1,000 tons of 2½-in. Devon or Welsh basalt, and 14,000 gallons of dehydrated tar, for the urban district council.—Mr. F. C. Uren, surveyor, Municipal Buildings, Aldershot.

LONDON.—April 3rd.—For the supply of granite setts for tramway purposes, for the county council.—General Manager, L.C.C. Tramways, 62 Finsbury-pavement, E.C.

CUDWORTH.—April 3rd.—For the supply of tarred slag, for the urban district council.—Mr. W. T. Lynam, surveyor, Council Offices, Cudworth, near Barnsley.

WHITSTABLE.—April 7th.—For the supply of hoggin, flints, and ballast, for the urban district council.—The Surveyor, 33 Oxford-street, Whitstable.

ALVASTON.—April 7th.—For the supply of 600 tons of 1½-in. to 2½-in. tar-macadam, and 25 tons of ½-in. tar-macadam, 25 tons of ¾-in. slag and dust, for the urban district council.—Mr. W. J. Holbrook, clerk, Alvaston, Derby.

WINSTREE.—April 10th.—For the supply of picked stones, sifted stones or gravel, carting, hire of horse, cart and man, broken Kentish flints, 1,100 tons of slag, and hire of steam rollers, for the rural district council.—The Acting Surveyor, Victoria-chambers, Colchester.

ROCHESTER.—April 11th.—For the supply of good ragstone and large block stones, of 2 cwt. or upwards, for the justices and commissioners of sewers.—Mr. E. L. Baker, clerk, Bank-chambers, Rochester.

BEXHILL.—April 13th.—For the supply of 500 to 1,000 tons of macadam broken to ½-in. to 2-in. gauge, for the corporation.—Borough Surveyor, Town Hall.

SOUTHBOROUGH.—April 14th.—For the supply of 650 tons of basalt, granite, or other suitable stone, for the urban district council.—The Surveyor, Council Offices, Southborough.

RUNCORN.—April 16th.—For the supply of granite macadam, setts, kerbstones and sanitary pipes, for the rural district council.—Mr. W. E. Hough, acting clerk, 71, High-street, Runcorn.

SHEERNESS.—April 16th.—For the supply of 300 yards of Leicester granite, 300 yards of clean hoggin, 200 yards of clean sharp sand, and 200 yards of Kent ragstone, for the urban district council.—Mr. V. H. Stallon, clerk, Council Offices, Sheerness.

BELCHAMP.—April 16th.—For the supply of broken granite and slag, for the rural district council.—Mr. S. Allpress, surveyor, Sudbury, Suffolk.

LATHOM.—For the supply of road materials and carting, for the urban district council.—Mr. T. Burrow, surveyor, Burscough Bridge, Lancs.

KILDARE.—For the supply of about 16,000 gallons of refined tar, for the county council.—The County Surveyor, Court House, Naas.

WINDSOR.—For the supply of 200 yards of fine gravel, for the corporation.—Borough Surveyor, Almaroad, Windsor.

Sanitary.

STANLEY.—April 3rd.—For cleansing ashpit and removing house refuse, for the urban district council.—Mr. J. Harris, sanitary inspector, Council Offices, Stanley.

DEWSBURY.—April 6th.—For the supply of ten tons of disinfecting powder and a quantity of disinfecting fluid, for the corporation.—Mr. H. Ellis, town clerk, Dewsbury.

DUMBARTON.—April 6th.—For scavenging certain districts, for the Eastern District Committee.—Mr. D. Dunbar, county sanitary inspector, 24 George-street, Glasgow.

ROYTON.—April 7th.—For the construction of a sewer and manholes, for the urban district council.—The Surveyor, Town Hall, Royton, Lancs.

Stores.

FALKIRK.—April 7th.—For the supply of whin material, including machine and hand-broken causeway setts and channel, ironmongery, cement, pitch and pitch oil, paints and oils, brushes, fire-clay pipes and connections, horse work and disinfectants, for the corporation.—Mr. T. McKee, burgh surveyor, Burgh-buildings, Falkirk.

Miscellaneous.

MANCHESTER.—April 10th.—For the supply and erection of chestnut wood fencing and gates for the Small Holdings and Allotments Committee.—City Surveyor, Town Hall.

The Surveyor

And Municipal and County Engineer.

Vol. LI. APRIL 6, 1917. No. 1,316.

Minutes of Proceedings.

Councillors' and Officials' Travelling Expenses.

The important county part of local administration has been somewhat prejudicially affected by the war in respect of the attendance of members. Services of trains have been cancelled, and railway fares have been raised, with the result that in many parts of the country a real grievance has arisen among members of county councils who are genuinely desirous of discharging their trust to the ratepayers, but who find themselves faced by difficulties that have been none of their own seeking or creation. The subject of the payment of reasonable travelling expenses to members of councils and officials has too frequently been discussed from a rather small-minded, not to say mean, point of view. The important public service which it may involve has been overlooked in an unworthy insistence upon the personal equation, as who should say somebody or other is bent upon extracting individual pleasure or satisfaction from an official engagement simply because it happens to be "away from home." Municipal engineers and surveyors are constantly the victims of this objectionable idea on the part of councillors, and there is therefore something of poetic justice in the fact that councillors are themselves feeling the pinch of dearer railway travelling and restricted facilities.

The question we note was raised recently at a meeting of the Convener's Committee of the Fife County Council by a councillor who, speaking by request, expressed the opinion that the travelling expenses of members of the county council should be paid. Many other bodies, he said, educational and agricultural, were meeting the cost of railway fares, and he asked that the practice should be adopted by the county council. Another councillor advocated that steps should be taken to obtain the views of the county council and the Scottish County Councils Association on the matter. The question, he remarked, had been raised in connection with the War Pensions Committee, on which were a good many working-men representatives. It was a fallacy, he thought—and most unprejudiced people will agree with him—to appoint working men to such boards unless they were not to be out of pocket. On the Fife Insurance Committee, of which he was a member, each member was allowed his third-class railway fare, but no allowance for the time he was away from home, and a working-man who had to lose a shift was recompensed for his loss of remunerative time. Another member complained that it was now a considerable expense for the members of the more distant districts to travel to Cupar, and he thought they would get better attendances if fares were paid. It was agreed to authorise a member to raise the matter at the April meeting of the Scottish County Councils Association, and it is to be trusted that this body will give it the consideration which it deserves. At the same time it would be advisable if municipal authorities were invited to give their attention to the question of officials' out-of-pocket expenses, and to the necessity for adopting some recognised and consistent rule with regard to them, so as to avoid the captious and unseemly criticism to which they so often give rise.

* * *

Cultivation of Lands Order.

In our present issue will be found the fifth and concluding instalment of an exhaustive article from the pen of Mr. Reginald Brown, in which he has been discussing during the past few weeks for the benefit of our readers the practical working out by local authorities of the powers conferred upon them by the Cultivation of Lands Order, 1916. The carrying out of the scheme has naturally fallen to the lot of surveyors, most of whom were already overworked and carrying on with depleted staffs. They have, however, risen nobly to the occasion, and although the excellent organisation of the work in the Southall-Norwood urban district may not have been equalled everywhere, a great deal of solid service has been ably rendered. The reasons for the necessity of a compulsory order are not far to seek. They are to be found in the constant hope of owners for a sale for building purposes, and in the unwillingness of cultivators to take land for allotments without some guarantee of a more or less permanent return on the labour expended in preparing it. Even with the compulsory Order in force, however, the second of these reasons is not entirely removed. At present the Board of Agriculture have said that they cannot guarantee the possession of plots after January 1, 1918, but it is satisfactory to observe that the Parliamentary Secretary to the board recently stated in answer to a question in the House of Commons that the question of a more

permanent occupation is under consideration, and that a further statement on the subject may be expected in the near future. It is perhaps rather late in the day to criticise the terms of the Order itself, but the omission of rural districts from its scope is certainly worthy of remark. We can, of course, only conjecture as to the reason for this omission; but, whatever it may be, the fact remains that the inhabitants of many villages are provided with garden space that is quite inadequate, and that unless private arrangements can be made with landowners, they could easily cultivate much larger areas than are available for their use. Our readers have no doubt observed that Mr. Brown has dealt with his subject in strict logical sequence, and the hints that he has given in regard to the detail work that has to be done after the lands have been acquired will no doubt prove of considerable assistance to others. It is interesting to note that, with all his experience, he does not consider that there is any present necessity for the cutting up of public parks and recreation grounds. There is always a temptation in certain quarters to take action of a spectacular nature in such a matter as that of a crisis in food production; but we entirely agree in the view that, in the absence of very exceptional circumstances, public recreation grounds, which exist for the benefit of the community at large, should not be interfered with. This week Mr. Brown deals with the vexed question of the supply and distribution of seed potatoes. The arrangements made by the Board of Agriculture in this connection were by no means ideal, but, on the whole, it may be said that the energy which they displayed augurs well for the future of our home-grown food supplies.

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Street Dangers.

We reproduce elsewhere the first circular emanating from the London "Safety First" Council. This has been sent to all the local authorities in the Greater London area, and in it are set forth certain suggestions as to street refuges, the position of lamp columns, the lighting of streets, obstructions at night, snow cleansing, and the whitening of kerbs. These suggestions are all of considerable value, and the various authorities which have been approached will no doubt give them careful consideration, as some of them apply to normal times quite as much as to the present abnormal conditions due to the war. It will be observed that nothing is said about the present dangerous rule of "Keep to the right," by which foot-passengers are obliged to walk near the kerb with the vehicular traffic behind them. It has been stated that more than half of the accidents which occur are due to this rule or practice, as pedestrians step suddenly off the kerb and are knocked over before they have time to look behind them. We have been accustomed for such a length of time to walk on the right side that a change to "Keep to the left" is not likely to be accomplished without a certain amount of trouble, but much of the difficulty attending it would be removed if Scotland Yard would only agree to the proposal. The "Safety First" Council have not lost sight of the importance of this change, and are taking steps to ascertain in what manner the alteration can best be effected.

Desirable as the proposed change may be, however, it seems to us that very careful consideration should be given to the best means for carrying it into effect if legal and practical difficulties are to be avoided. To deal first with the latter, we observe that it is stated that three towns (Shoreditch, Richmond, and Ayr) have already adopted the change, while a fourth (Glasgow) has the question under consideration. Surely, however, the change to any which it is to be carried out at all, should be introduced simultaneously throughout the country. Otherwise the resulting confusion will probably more than counteract any advantage which may accrue from a partial change of practice. The legal difficulty appears to us to be even greater. We are not aware what steps have been or are being taken to secure the change in the towns above mentioned. If the existing rule depends for its force upon general custom, it is part of the common law of the land, and so can hardly be varied by by-law. Indeed, any such by-law, even if it secured confirmation, would probably be held by the Courts to be invalid as being repugnant to the general law, in that it would purport to make unlawful something which the general law says is lawful. Similarly the mere exhibition of notices might not be effective, for, in case of accident, the responsibility might still be fixed by the law according to the common law rule. It would appear therefore that special legislation would be necessary to effect the proposed change; but, even so, it is of such obvious practical utility, and public opinion in its favour is forming so rapidly, that time might be found for the passage of a short measure dealing with the subject.

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Tramways and Road Subsidence.

In the current issue of the Journal of the Tramways and Light Railways Association there appears a note of considerable general interest on the question of the rights of a tramway company, part of whose track had been let down by a subsidence caused by colliery workings underneath. The question was submitted quite generally to the association's honorary solicitor, and in the course of a comprehensive reply it is pointed out that the right of support, upon payment of compensation for non-working, which is given by statute to local authorities as regards their sewers, and to gas and water authorities as regards their mains, is not enjoyed by tramway undertakers. On the contrary, sec. 59 of the Tramways Act, 1870, provides specifically that "Nothing in this Act shall limit or interfere with the rights of any owner, lessee, or occupier of any mines or minerals lying under or adjacent to any road along or across which any tramway shall be laid to work such mines and minerals, nor shall any such owner, lessee or occupier be liable to make good or pay compensation for any damage which may be occasioned to such tramway by the working in the usual and ordinary course of their mines or minerals." It will be observed that this section is limited in its application to tramways that are laid "along or across a road." It not infrequently happens, however, that tramway track is constructed on land acquired under a Provisional Order or Special Act, or on land over which an easement has been acquired in this way. In such cases it appears that the rights of the parties depend upon the terms of the purchase subject to this, however, that, in the absence of a specific reservation to the owner or occupier of minerals to let down the surface, sufficient support must be left for the track, and if this is not done, and subsidence occurs, a remedy will lie in damages.

* * *

The Decimal System.

We are living in days of change, and there are many things less likely than that one of the indirect results of the war may be the establishment in this country of the decimal system of weights and measures. This reform was strenuously advocated by Mr. Harry Allcock, M.I.E.E., in a lecture on the subject which he delivered recently before the Institution of Civil Engineers. The introduction of such a radical change in our social system could not, of course, be effected without some temporary dislocation; but with the cordial co-operation and goodwill of the leaders of the principal professional and business interests involved, we cannot help thinking that satisfactory means can be devised for over-

coming this difficulty. The question is one in regard to which the views of engineers are of primary importance, and there is ample evidence that the bulk of professional opinion is in favour of the change. Indeed, the council of the Institution of Electrical Engineers has made a recommendation to a committee of the Board of Trade appointed to consider the position of electrical trades after the war that the use of the metric system be made compulsory after a reasonable period. It is further recommended that during this period of transition all trade catalogues shall show both the British and metric systems. Perhaps the chief difficulty that would be imposed upon engineers in connection with such a change would arise in connection with trade with America. This in itself is no small objection, and it would certainly be to the common advantage if that country could be induced to fall into line at the same time.

* * *

A Municipal Research Bureau. An announcement has just been issued by the Bureau of Municipal Research, established in New York City, which, although reading strangely to British engineers, may arouse some interest in this country. The announcement is none other than that the Bureau is prepared for a fee to afford to municipal authorities special information and advice relative to practically any phase of city government which does not involve sending staff men into the field. The fee to be charged is graduated, according to the population of the city seeking advice. The director of the Bureau, Mr. F. A. Cleveland, is assisted by a staff of engineering experts in various phases of municipal work, so that, on the engineering side, the Bureau is not unlike an organisation for securing the services of consulting engineers at stereotyped fees. A long list of subjects has been issued on which the Bureau is ready to give advice. They cover the whole field of municipal activity, from town planning to the collection of refuse, and from departmental organisation to drains. We gather that one function which has been undertaken by the Bureau is the collection and collation of statistics from several towns, so as to render readily accessible the information on a variety of subjects thus gained. Although the establishment of such a Bureau in this country is hardly to be expected, there appears to be no reason why some of the existing associations of local authorities and professional institutions should not develop on the lines indicated to a greater extent than they have done up to the present.

* * *

Professional Men and National Service. The Surveyors' Institution has issued to its members a useful and timely circular explaining the arrangements made by the Director-General of National Service for the purpose of meeting the special needs of professional men desirous of enrolling under his scheme. It appears that all Forms N.S.V. 1, signed by volunteers, are sent to Kew for classification, and those where the entry opposite "(e) Occupation" indicates that the volunteer is of the professional classes are referred to the Professional Classes Branch of the National Service Volunteers, the head offices of which are at Queen Anne's Chambers, the Broadway, Westminster, with branches in the principal provincial towns. Care should therefore be taken to describe the occupation correctly, making clear its professional character, when filling in the Form. Volunteers of the professional classes, unless they have signified their willingness to do so under heading "(k)," will not be expected to accept positions involving manual labour, or carrying remuneration at rates which their domestic and other responsibilities would make obviously inadequate; nor, in any case, is a legal liability imposed upon the volunteer to accept any particular post offered to him. Should volunteers of the professional classes find that, through unavoidable error, their Forms have been sent to the ordinary Labour Exchanges, a request should be made that they should be referred to the nearest Professional Classes Branch. This will at once be complied with.

* * *

War-Time Contracts. An appeal to the House of Lords has been decided upon by the Metropolitan Water Board following the recent decision of the Court of Appeal in the matter of the board's action against Messrs. Dick, Kerr & Co., Limited. It will be remembered that, acting under the powers of the Defence of the Realm Act, the Ministry of Munitions served a notice upon the contractors ordering the cessation of work on the Littleton reservoir. Questions thereupon arose between the board and the contractors as to the legal effect of this upon the contract. The board eventually commenced an action in the High Court for a declaration on the matter. In the Court of first instance Mr. Justice Bray decided that the contract was merely suspended by the act of the Ministry of Munitions. The Court of Appeal, however, have—as reported in our issue of March 9th last—reversed this decision by holding that the service of the notice terminated the contract. The principle involved applies not only to the Littleton reservoir contract, but also to that for the construction of the board's new head offices in Rosebery-avenue. Having regard, therefore, to the importance of the matter and to the large sum involved, the Law and Parliamentary Committee are of opinion that the board have no alternative but to take the case to the House of Lords for final decision, and have issued instructions accordingly.

* * *

A Ministry of Health. The Bill on health questions which Lord Rhondda intends to introduce will, it is understood, provide for the creation of a Ministry of Health. But, according to the *Manchester Guardian*, there is no intention of creating a new Government Department and a new Minister, as has been assumed in some quarters. What is proposed is to co-ordinate the various health activities now scattered among several departments into one control. The new authority would probably take the form of a greatly enlarged and better equipped Health Section of the present Local Government Board. Lord Rhondda is known to be deeply impressed with the necessity of putting an end to the overlapping in the health administration, official and unofficial, that goes on at present, and his views have just received the support of an influential organisation interested in questions of social reform, which has issued a report advocating the National Health Department as part of a reorganised and rechristened Local Government Board.

The Upkeep of Railway Bridges.—In the course of the last meeting of the executive council of the County Councils Association, the Parliamentary Committee reported that they had considered a resolution received from the Somerset County Council requesting the association to confer with the Association of Municipal Corporations and the Urban and Rural District Councils Associations in order to obtain a change in the law whereby the decision of the House of Lords in the recent case of Attorney-General (on the relation of Pickfords, Limited, *v.* Great Northern Railway Company) may be reversed, and the same responsibility may be placed on railway companies in respect of bridges carrying highways over their railways, as if they were road authorities. It was decided to bring the question before the Joint Committee on Road Traffic when appointed.

Some Duties of a Surveyor.*

By A. ROTHERA, Surveyor and Water Engineer, Spenborough Urban District Council.

In presenting a paper to the members of the North-[illegible] the author must first excuse himself, [illegible] the energies of a surveyor have [illegible] ways that it is impossible [illegible] writing papers which involve a great deal of [illegible]. Reports to committees and council meetings, though short, require the few [illegible] from doing typewriting, [illegible] the surveyor in war time. In towns the size of Spenborough every department is [illegible] part of the surveyor's, being [illegible] way that does not obtain in [illegible] unit of municipal work is [illegible] all a part of one immense undertaking. The majority of the members will appreciate the point referred to, for they, like the author, must be identified with everything of a municipal and honorary character, a discreet Government generally being silent over any grants for extra work any Act of Parliament or Order in Council may confer upon us, whilst other brother [illegible] extent secured some benefit through the different Acts and Orders made during the war. The author cannot say what this is due [illegible] to one very active associa-tion, who never let opportunities pass of pressing the [illegible] have been called upon to [illegible] national character, through the Acts and Orders referred to.

The author [illegible] when peace is declared local authorities will recognise the great disadvantages the various officials have been working under, and not [illegible] to be launched with the same staff, and perhaps the deduction of the war bonus. [illegible] a common thought which prevails amongst many authorities, and a useful work might be done by collecting information on this point for use after the war.

[illegible] future events is made, the author contenting himself with placing before you a few points that arise in the duties of a surveyor, which present problems regularly happening, and [illegible] of opinion are invited.

The Public Health Acts Amendment Act, 1907, was designed to help local authorities, and has succeeded in doing so in some cases, but various amendments [illegible] could be made in any [illegible] Act.

At all times [illegible] policy has to be exercised in dealing with owners and others, also mem-[illegible] Act, section and sub-[illegible] taken by the surveyor. It therefore follows that, although one may exercise [illegible] by the necessary [illegible]

[illegible] OF PLANS.

[illegible] proposal to that effect, which the author has [illegible]

SURFACE WATER DRAINS.

In the case of surface water drains from roads, there does not appear to be any Act governing its admission into streams, and in several cases in the author's experience, where roads run alongside streams or rivers separated by only the fence and retaining wall, the drain from the gullies has been connected direct to the stream, the owner on the opposite side of the stream contending that a trespass had been committed, and threatening legal proceedings, which never developed on a firm stand being made by the authority. The word "surface" covers a wide area; the rivers and streams drain all surfaces or take the water not absorbed direct to the stream, and the drainage from a road is only continuing the same natural law, only the surface is an improved or artificial one.

In the case in point the owner argued that the whole of the wall was his; when it fell a few months afterwards he asked the council to rebuild it, but not at his cost.

RETAINING AND FENCE WALLS.

Take the case of retaining and fence walls alongside public roads. What help does a local authority receive from Section 31 of the Act quoted?—in the only case known to the author where the Local Government Board could have helped the authority, they deliberately gave a decision, after an exhaustive enquiry, which was altogether opposed to the evidence given, and ocular demonstration, of the very grave danger that existed along an important main road owing to a ruinous fence, where the surface of the adjoining field was several feet below the road level. The verdict was helpful to neither side, but to make the place safe the county council decided to do the work.

There may be no Act or Order which defines the duties of a local authority in this respect, but as a general rule the fences above the road level where one serves as a protection, and the other as a retaining fence for earth above the road level, are repairable by the owner, and the retaining wall supporting the road is maintainable by the authority. That has been the author's practice, and generally he has had no difficulty in getting owners to do the work on the lines mentioned; but when a Government Department, which dominates municipal authorities, has a chance of giving a lead, it adopts a policy which gives no help whatever to the authority. Such a Department could give a neutral or unbiassed opinion without any [illegible] of an officer's position, but the "wait and see" tactics as a rule favour an owner, and are a deliberate "spragg" to the well-intentioned activities of many authorities. Cases will very likely be well known to members where the Board have expressed the opinion that, should the council decide to go forward with the carrying out of works involving the remedying of insanitary conditions after notice to the owner, they will give an opinion as to its legality after the work is carried out, or whether it should have been done during the war. The best course would be absolutely to forbid it, and each party would then know their position.

CONVERSION OF OLD BUILDINGS.

The Acts governing the conversion of old buildings could with advantage to good sanitary conditions be considerably amended, and it is a disappointment that the 1907 Act did not give more help to an authority in this respect, seeing that it is a modern one—perhaps no surveyor had the opportunity of helping to draft it?

Take the section in the same Act governing the repairing or enclosing of dangerous places. The whole purport of this section is considerably weakened by the use of the word "may" instead of "shall," and most authorities refuse at once to proceed further for this reason, unless a councillor has seen one or two stones tumble out of the wall. In matters affecting important and urgent matters of this character, the wording should be clear and definite, but how often [illegible]

PRIVATE STREET WORKS.

Take Section 19 in the same Act. Can any member say whether they have done urgent repairs to private streets, and if so, has it included "part" only? It may be that a few yards in length only needs atten-

tion, but can it be done by the authority under the section named? The Private Streets Works Act of 1892 mentions "part" or "parts," but opinions of eminent counsel put a different construction upon the strict interpretation of the words mentioned, that make it a gamble almost for a local authority to embark on the repair of "part" of a street. Perhaps it may be argued that the point mentioned would be settled before the work was done, as mentioned in sec. 7, but no help seems to be given in that respect.

Take sec. 18 of the 1907 Act. What use is it to a local authority? The author prefers to do the repairs to the footpaths in his own district with his own workmen where a new crossing or entrance is concerned, and the contingency has still to arise where the section quoted would be of help to prevent the claim of domineering individuals who eloquently proclaim their rights as ratepayers in such matters.

SANITARY MATTERS.

The further sections of the 1907 Act dealing with the sanitary provisions are helpful to a surveyor in many ways, but in sec. 39 (sub-sec. 4) the clause dealing with the conversion of pail and privy closets ought to have been dealt with in a different way, and the fairest would be to make it half cost for the authority for the conversion of a pail closet, nothing to be allowed for the privy closet.

The testing of drains as laid down in sec. 45 mentions for the first time in any Act of Parliament what tests may and may not be applied, and although the hydraulic test is the only sure one for the qualities of a good drain, and is used in most districts, the assistance of a surveyor in the drafting of the Act might have resulted in the suppression of the few words about the water test, resulting in considerable strengthening of our position towards securing a good job.

ROAD OPENINGS.

It may be of interest to some of the members to know the author's procedure with respect to the openings into public roads by private individuals: he does not refer to any company possessing a statutory right to do this work.

Any contractor desirous of laying any drain, water pipe, &c., first makes a deposit and signs the forms provided before commencing the work, the amount necessary being determined by approximate lineal measurement of the surface disturbed, and marked against the different classes of macadam, &c., set out on the form, to which a rate or schedule price is affixed. At the conclusion of the work the exact length is measured by the foreman, and only entered in the journal when the work is complete. Sometimes it is necessary for the contractor to pay an additional sum, or part of the deposit is returned. The author will be pleased to supply any member with a copy of the form should they think it will be useful.

The same form also serves for the provision of connections to all sewers, which are carried by the workmen in his department, a charge of 2s. 6d. being made for the work.

The returns from reinstatement repairs have proved very lucrative in the past, for, save for companies, no work of this character has been charged for, and although the author cannot yet speak of his new district as to the returns, the receipts in his old one reached over £200 per annum, and an average of four years gave £160, or nearly equal to a penny rate.

By the method adopted all openings are known to him—they, of course, may be to others—but he has the extra satisfaction of knowing they are all nearly paid for, and the oversight of them is not so much lost time so far as financial returns are concerned.

STUDS IN ROAD LOCOMOTIVE WHEELS.

Any meeting of surveyors held at this period should not fail to make some comment on the new order recently made by the Local Government Board with reference to the use of studs for wheels of road locomotives, and it is hoped that it will be revoked soon after the declaration of peace. Attachments of this kind can do serious harm to road surfaces by causing fracture of separate stones at the point of impact with the stud, resulting in a loosening of the surface and internal attrition. It is hoped that on this important point the institution will, at the proper time, bring the matter before the board, with a view to having the order revoked.

ROAD SURFACES.

Touching on the question of road surfaces in a general sort of way, and the very wide use of tarred material, some very radical alterations will have to be made in the shoeing of horses if the real benefits its use should confer are really felt by a local authority. The laying down of a road of this description in most localities is hailed with delight by a very large section of the ratepayers; the minority, though in the category of having to bow to superior numbers, make up any deficiency by the use of choice and very fluent language. This is directed at first against the surveyor, and as the work proceeds workmen live in a very black atmosphere throughout the day whilst doing the work, and when finished, the call is for more chippings, grit, or sand to prevent horses "slipping" (so they say), but really so that the driver can continue in the same sweet way of smoking his pipe, riding in his cart, and talking to any companions he may see on his way.

Observations of roads during the bad labour conditions last year, and when grit, &c., had been thrown on day after day, almost made the author think that it was an ordinary macadam road. In London, where a different method of shoeing is adopted, and where some surfaces are smoother than any he lays down, he always noticed that the grit thrown on is very meagre in quantity to that thrown on in the north country towns—a contrast, one may venture to say, in favour of the different methods of shoeing practised in the south. Some time ago a competition organised by the Roads Improvement Association resulted in a good number of designs, and awards were made, a north country shoeing smith, hailing from Harrogate, obtaining a prize, but no practical result seems to have developed in his district, the present methods not utilising the "frog" of the horse as Nature intended.

PUBLIC HEALTH LAW.

In closing a paper which is to some extent more of a general nature and a deviation from orthodox lines, a reference to the cumbersome methods of public health law may not be out of place. How many Acts have been placed on the statute book since 1875 the author cannot say, but it would be an undoubted boon to all public officials if a revision and remodelling of the various Acts and Orders were made, and combined in a few volumes, arranged so that a reference could be made at once to a particular section, for any work in hand upon which advice had to be given to an authority. The war has broken many traditions, and one of the biggest is the financial side. Before it commenced no money could be spared for road developments and housing, but as it progressed or dragged on the spending of millions to help to kill and maim would have made a much happier, healthy and delightful Great Britain. How we could have revelled in road widening, new roads, garden cities, &c., coming near to or perhaps surpassing the pen picture of a city given to us in his famous book by that sanitary authority the late Sir Benjamin Richardson!

AFTER THE WAR.

The author ventures on no prophecy as to the far-reaching effects of the war after peace is declared, but a reasonable one would be that municipal progress had to a large extent been stopped, in the way of extensive developments in housing, town planning, and road improvements, unless, as previously mentioned, the traditions broken reveal a Government fully alive to the needs of the nation, who will foster progress on such sound lines that the State will at last take upon itself the burdens that affect national well-being, and not pass them along to the public authorities for execution, with a consequent addition to the rates of any town.

The institution will, no doubt, be considering the various ways and means with respect to placing on some definite basis its claims and aims, of matters affecting its numerous members after the war, and strong representations should be made towards supporting other powerful associations who are now busy formulating and getting into shape schemes for presentation to the Government at the cessation of hostilities. The Government should, by means of the institution, be made aware that the members' claims for consideration are strong ones; a body so important should not only have that claim, but be sought after, when important Local Government Acts are being drafted, and in the same way when the future important details of new and far-reaching proposals are discussed. The council should be a large factor in determining the policy with regard to housing, road developments, and the revision of the Acts relating thereto. If this can be done they will have justified their existence, and be deserving of all

[illegible] criticism of their actions has been freely expressed lately, and not without reason. There are other matters more important than standardisation which demand more thought and discussion. If as was applied to the question of "standard salaries" more satisfaction would result, for since the war advertisements for surveyors at such miserable salaries have been a disgrace to both councils and the applicants for the positions. This is not the time for causing any disruption within the ranks, but the author sounds a warning note to the institution in asking the "Cabinet" to put a little more "push and go" into their deliberations, and at meetings he will observe the motto engraved on all public buildings in France.

TIMBER SUBSTITUTES.

GOVERNMENT AND THE USE OF CONCRETE AND REINFORCED CONCRETE.

In the House of Commons on Monday, Sir E. Lamb asked the Financial Secretary to the War Office whether any steps are to be taken by the Director of Timber Supplies to obtain a substantial reduction of the timber employed in the United Kingdom by encouraging the use of such substitutes as concrete and reinforced concrete in the construction of temporary buildings used for war purposes; and whether any similar steps will be taken to encourage a more general use of reinforced concrete for telegraph poles, fence posts, railway sleepers, and pit props, &c., by circulating particulars of the satisfactory experience obtained in the United States and several Continental countries.

Mr. Foster: The use of concrete and ferro-concrete as a substitute for timber in the construction of buildings, and for railway and colliery purposes, has been receiving careful attention for some time past. I will consider the suggestion made in the last part of the question.

Sir E. Lamb asked the Chancellor of the Exchequer whether he can see his way to notify the various spending Departments of His Majesty's Government of the advantages of utilising wherever possible concrete comprising local aggregates with home-made binding materials, in lieu of timber, which has to be largely carried by sea or rail; whether he is aware that the life of concrete is naturally longer than that of timber; that the cost of maintenance of temporary buildings constructed of concrete is a negligible item, whilst

THE COST OF MAINTAINING TIMBER STRUCTURES

is often heavy; and that concrete fence posts, telegraph posts, and similar accessories are to-day cheaper than timber fence posts, telegraph posts, &c.; and whether he can see his way to set up a small technical committee to advise the spending Departments, the railway companies, the factory owners, and the public generally how best to effect substantial economies by using local aggregates and home-made binding materials, whereby money would be kept in the country and a substantial amount of tonnage, railway freight, and cartage released for purposes of national importance.

Sir Alfred Mond: My right hon. friend has asked me to reply to this question. The various Departments of His Majesty's Government concerned in the erection of permanent or temporary buildings are well aware of the economies of concrete, both as regards initial expense and the subsequent charges for maintenance. A Cabinet Instruction has already been issued as to the necessity of avoiding the use of timber wherever possible. In view of the fact that all building operations are now restricted to those sanctioned by a Government Department, and that all the Departments concerned are alive to the necessity for utilising substitutes for timber in the cases mentioned, I do not think that any useful purpose would be served by the appointment of a technical committee such as is suggested.

Sir E. Lamb asked the First Commissioner of Works whether he can see his way to take steps to employ, to a greater extent than heretofore, concrete and reinforced concrete for the numerous buildings which are being erected by his Department for war purposes, so that a substantial economy may be effected in the amount of timber utilised; and whether he is aware that concrete hollow blocks, concrete, and reinforced concrete are non-proprietary products, composing to the extent of about two-thirds of their bulk local aggregate, such as gravel, ballast, or stone, and that a material economy in transporation would be effected by a more general use of such materials in lieu of timber.

Sir A. Mond: My Department has for many years past resorted to the use of reinforced concrete for buildings erected under its supervision, and since the war has used not only that method of construction, but also concrete slabs and brickwork for constructional purposes in suitable instances in lieu of timber, and from inquiries which I have made I am satisfied that no further substantial economy can be effected in this direction. The reply to the latter part of the question is in the affirmative.

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ
(One man does not see everything.)
—Euripides.

UTILISATION OF WASTE MATERIALS.

To the Editor of The Surveyor.

Sir,—The suggestion issued by Lord Rhondda asking the public to do what is possible in the utilisation of materials which in less strenuous days were considered to be useless—or perhaps it should be said not worth conservation—have caused many who desire to do what they can in this direction to find themselves helpless because there is no centre to which the waste material can be taken. In almost every house there are books, papers, bottles, and broken glass, and articles of rubber, brass, steel and iron, which, for want of a ready means of disposal, are either destroyed or put into out-of-the-way places, and if these hoards of no account could be removed and destruction stopped, a contribution of benefit to the country should be obtained. The means of conveyance from the owners' homes to the depot is the first essential, a staff for sorting is the next, and, finally, the means of conveying the sundries to the places where they can be best utilised, is wanted. The last-mentioned would seem to be the least difficult, having regard to the empty wagons which day after day are dispatched from railway depots throughout the country to the collieries. If some of these wagons could on their journeys carry material that can be utilised in the districts through which the wagons pass, the most important part of Lord Rhondda's proposition would be decided. I know the officers of the local authorities would, if they have the support of their Sanitary Committees, find a way to get the sorted materials to the depots.

As the whole matter has been the subject of editorial reference, I am emboldened to submit this to your judgment.—Yours, &c.,

Wm. Chas. Clifford Smith, M.Inst.C.E.
40, Craven-street, Strand, W.C. 2.
April 3, 1917.

SCAVENGING.

To the Editor of The Surveyor.

Sir,—With reference to the communication from Mr. F. Hall Smith, on page 310 of your issue of March 23rd, he calls attention to a discussion of the Grimsby Sanitary Committee with reference to the age of men employed for household scavening. I quite agree with his remark, and can only say that the correspondent who sent you the previous paragraph must have made some error (I am not prepared to blame the printer).

The remark made by one of my aldermen was that the work might very well be done by men over military age, with which I entirely agree.—Yours, &c.,

H. Gilbert Whyatt, M.Inst.C.E.,
Borough Engineer and Surveyor.

Grimsby, March 30, 1917.

[Mr. Whyatt forwards a cutting from a local paper in support of his statement. In the paragraph to which he refers it was reported that the Grimsby committee held that "scavenging is work for old men and not the able-bodied young."—Ed. Surveyor.]

WORKMEN'S WAGES.

To the Editor of The Surveyor.

Sir,—Will you please allow me to inquire through your columns the names of county and rural district councils who pay their workmen by the hour?—Yours, &c.,

James A. Iveson,
Surveyor, Scarborough Rural District Council.
14 Dean-road,
Scarborough.
March 31, 1917.

Comparative Reports of General Practice.—(LXXXVI.)

CEMETERY CHARGES IN THE METROPOLIS.

The Camberwell Public Service Committee have had under consideration the charges at present in force for interments at the borough council's cemetery, and have obtained particulars—which are set out below—as to the charges made at other Metropolitan cemeteries.

CAMBERWELL.

Common Graves: Parishioner, 18s. 6d., including turfing and moulding; non-parishioner, not accepted.

Private Earthen Graves: Parishioner, adult £1 7s., child 16s. 6d.; non-parishioner, adult £1 16s., child £1 3s. 8d.

Vault and Brick Graves: Parishioner, adult £1 14s., child £1 4s. 6d.; non-parishioner, adult £2 9s. 6d. (9 ft. by 4 ft.), £2 19s. 6d. (9 ft. by 6 ft. 6 in.); child £1 12s. 8d. (9 ft. by 4 ft.), £1 19s. 4d. (9 ft. by 6 ft. 6 in.).

Digging: 1s. per foot up to 7 ft., and 2s. 6d. per foot over.

BATTERSEA.

Common Graves: Parishioner 14s.; non-parishioner 15s.

Private Earthen Graves: Parishioner, adult 17s. 6d. to £1 17s. 6d., according to class; child, same as adult; non-parishioner, adult £1 7s. 6d. to £3, according to class; child, same as adult.

Vault and Brick Graves: Parishioner, adult £2 2s., child £2 2s.; non-parishioner, adult £3 3s., child £3 3s.

Digging: 4s. per depth, which allows one interment.

DEPTFORD.

Common Graves: Parishioner 15s. 6d., non-parishioner £3 16s.

Private Earthen Graves: Parishioner, adult £1 7s. to £2 12s., according to class; child, same as adult; non-parishioner, adult £4 18s. to £9 8s.; child, same as adult.

Vault and Brick Graves: Same as earthen graves.

Digging: 2s. per foot to 10 ft., 2s. 6d. per foot 10 ft. to 12 ft., and 3s. per foot over 12 ft.

WANDSWORTH.

(*a*) Putney Vale Cemetery.

Common Graves: Parishioner 18s. to 19s., non-parishioner £2 14s. to £2 17s.

Private Earthen Graves: Parishioner, adult £1 7s. to £5, according to class; child £1 2s. to £4, according to class. If grave was acquired prior to March, 1903, the fees charged are those in force when grave was purchased. Non-parishioner, fees trebled, both for adults and children, except for interments at depths exceeding 8 ft., and where exclusive right of burial was acquired prior to becoming a non-parishioner.

Vault and Brick Graves: Same fees charged and same conditions, both for parishioners and non-parishioners.

Digging: 8 ft. to 10 ft. an additional 5s., 10 ft. to 12 ft. an additional 12s., and 12 ft. to 14 ft. an additional 24s.

(*b*) Streatham and Wandsworth Cemeteries.

Common Graves: Parishioner 16s., non-parishioner £1 7s.

Private Earthen Graves: Parishioner, adult £1 7s. to £5, according to class; child, £1 2s. to £4, according to class. If grave was acquired prior to March, 1903, the fees charged are those in force when grave was purchased. Non-parishioner, fees doubled, both for children and adults, except for interments exceeding 8 ft., and where exclusive right of burial was acquired prior to becoming a non-parishioner.

Vault and Brick Graves: Same fees charged and same conditions, both for parishioners and non-parishioners.

Digging: 8 ft. to 10 ft. an additional 5s., 10 ft. to 12 ft. an additional 12s., and 12 ft. to 14 ft. an additional 24s.

LAMBETH.

Common Graves: Parishioners 13s. 6d., including turfing and moulding; non-parishioner £1 17s. 6d.

Private Earthen Graves: Parishioner, adult £1 5s. and £1 16s., including turfing and moulding; child, 18s. and £1 5s., including turfing and moulding; non-parishioner, adult £3 10s. and £5 6s. 6d., including turfing and moulding; child, £2 9s. 6d. and £3 14s. 6d., including turfing and moulding.

Vault and Brick Graves: Same fees as for earthen graves.

Digging: 5 ft. to 10 ft. 2s. per foot, 10 ft. to 16 ft. 3s. per foot.

LEWISHAM.

Common Graves: Parishioner 15s., non-parishioner £1 10s.

Private Earthen Graves: Parishioner, adult £1 11s. and £2 4s., according to class; child, same as adult; non-parishioner, adult £3 2s. and £4 8s., according to class; child, same as adult.

Vault and Brick Graves: Parishioner, adult £2 6s. and £2 19s.; child, same as adult; non-parishioner, adult £4 12s. and £5 15s.; child, same as adult.

Digging.—Up to 9 ft. included in interment fee. 10 ft. to 15 ft. 3s. per foot.

NUNHEAD.

Common Graves: Parishioner £1 11s. 6d.

Private Earthen Graves: Parishioner, adult £2 2s. to £4 4s., according to position; child, £1 8s. to £2 2s.; non-parishioner, same.

Vault and Brick Graves: Parishioner, adult £5 5s. and £6 6s., child £3 10s. and £4 4s.; non-parishioner, same.

Digging: 7 ft., 12s. 6d.; 8 ft., 15s.; 9 ft., 18s.; 10 ft., £1 0s. 6d.; 11 ft., £1 4s.; 12 ft., £1 7s.

NORWOOD.

Common Graves: Parishioner £2 2s.

Private Earthen Graves: Parishioner, adult £2 2s. to £5 5s., according to position; child £1 10s. to £3 10s.; non-parishioner, adult, same.

Vault and Brick Graves: Parishioner, adult £6 6s., child £4 4s.; non-parishioner, same for both adult and child.

Digging: 5 ft., 6s.; 6 ft. 8s.; 7 ft., 10s. 6d.; 8 ft., 13s.; 9 ft., 15s. 6d.; 10 ft., 18s.; 11 ft., £1 1s.; 12 ft., £1 4s.

CAMBERWELL COMMITTEE'S RECOMMENDATIONS.

The Public Service Committee of Camberwell Borough Council point out that the present charges at the Camberwell cemetery are generally less than those at the cemeteries of other Metropolitan authorities, and having regard also to the increased cost of labour and materials they propose that the fees should be revised as under:—

Common Graves: Parishioner £1, including turfing and moulding; non-parishioner, not accepted.

Private Earthen Graves: Parishioner, adult £1 10s., child 18s.; non-parishioner, adult £2 10s., child £1 10s.

Vault and Brick Graves: Parishioner, adult £3, child £2; non-parishioner, adult £4 (9 ft. by 4 ft.), £5 (9 ft. by 6 ft. 6 in.), child £2 10s. (9 ft. by 4 ft.), £3 (9 ft. by 6 ft. 6 in.).

Digging: 10s. up to and including 7 ft., and 2s. 6d. per foot over.

Corporation Labourers' Holidays.—Dublin Finance Committee, having considered a claim on behalf of the temporary labourers employed by the corporation for a week's leave, as given to those in permanent employment, have decided to grant it to all those having three years' continuous service.

British Association Meeting Suspended.—In consideration of the restriction of railway travelling and of other circumstances arising out of the war, it has been decided that no meeting of the British Association shall be held this year. The annual meeting will therefore be intermitted for the first time in the history of the Association since 1831.

THINGS ONE WOULD LIKE TO KNOW.

(*Contributed.*)

Should not one be extra careful in writing very courteously when filling up one's qualifications on the back of the National Service scheme when one reads in the "Times" that a prominent employer of labour in Scotland, a peer (known as "organiser," and was surprised to find that he was sent to the docks to help in unloading ships, and that when he protested it was found that the clerk who had dealt with his application form had entered him in the record as "organiser grade"?

* * * *

Is there a possibility that the appeal now being made by the Engineering Standards Committee for more funds is successful, we shall be able to purchase "Britishstandard" specifications at a fixed price or are we still going to pay the high prices now charged for some of these specifications? Would not this be a great boon to the profession, and is it not sincerely to be hoped that the efforts to obtain sufficient funds for this purpose will be successful.

* * * *

What are the efforts that are now being made to make use of Solar rays for power purposes ever come to a practical head? When we read that in India and elsewhere considerable strides in this direction have been made with solar ovens for cooking, and that even small models, of small power, can be made to work, is it not possible that in the near future more use will be made of the sun's rays in a direct manner instead of only being able to use this power indirectly by the combustion of coal?

* * * *

Is it not very satisfactory to find that the progressive and excellent Richmond (Surrey) Town Council are the first to adopt the wise alteration suggested by the "Safety First" Council, as to the rule for pedestrian traffic, and have determined by a large majority to refer the matter to a committee to consider the desirability of putting up notices to carry the resolution into effect? Is it not to be hoped that other local authorities will follow their example, and that the time is not far distant when the dangerous regulation, or practice, of "Keep to the right," for pedestrians, will be universally altered to "Keep to the left"?

* * * *

Have we not every sympathy with the Hartlepool branch of the Association of Draughtsmen who, at a recent meeting complained of the inadequate salary paid to draughtsmen in many of the "shops" as compared with the wages paid to skilled, as well as unskilled, workmen? Does it not seem to be rather an anomaly that men who have had to be trained at considerable expense to themselves should sometimes be content to receive lower wages than a stalwart navvy, who may be almost as unimaginative as the machine he is tending?

* * * *

Is it not well that local authorities should know that under the Defence of the Realm Act persons selling game otherwise than in open markets, even if the land is their own, can be summoned before the magistrates and fined? Was it not satisfactory to see that two cases were thus summoned the other day at East Ham and fined 40s., or in default thirty-one days' imprisonment, for selling even allotments which had been [illegible]?

* * * *

Is it not interesting to see that Mr. Parker Rees, a Director of Works Service under the Ministry of Labour, has taken up the subject of the waste of heat in our dustbins, and has promised that a series of cooking films on "some of the things to be found in the dustbins of well-to-do London" will shortly be exhibited? Is there not a big opportunity now existing for a company to be started to deal, on scientific lines, with [illegible] in which there is undoubtedly a large amount of valuable products in addition to the heat which is now wasted either burnt in dustbins or thrown upon [illegible] tips? Now that the Government have taken up the subject may we not hope for some progress in this direction?

* * * *

Does it not seem strange that, with there being a great shortage of [illegible] in this country, and our local authorities, in many cases pressed as to how to obtain labour for important [illegible] work, there should be seen so many private cars rushing along certain roads on their way to race meetings? When we consider that owing to shortage of petrol and other reasons, so many motor omnibuses are being withdrawn from the streets with ruinous results to persons of both sexes who are engaged in munition or other war work, is it not surprising that these "sportsmen" should still be allowed to use motors and petrol in order to continue their pursuit of pleasure?

* * * *

Do we not hear on all sides of the lamentable condition of our roads and streets owing to the shortage of labour and materials? What is going to be done when the state of our highways becomes so bad that travelling will be almost impossible on them? Should not this serious problem take precedence over such questions as town planning, education, and so forth?

THE TESTING OF FIRE HYDRANTS.

COUNCIL AND WATER COMPANY.

The Hayes, Middlesex, Urban District Council are endeavouring to secure freedom in the use and testing of fire hydrants on the mains of the Rickmansworth and Uxbridge Valley Water Company. The company (according to *The Fireman*) decline to afford the facilities required, and argues that they are amenable only to the general law which operates uniformly throughout the country. Their case is as follows:—

1. The valve spindles of the hydrants are the only parts sealed. The loose caps to the outlets can at any time be removed by brigades, and a dry drill carried out without notice being given to the company. A drill of this description is quite sufficient in order see that the threads of all the appliances are in working order.

2. Experience has shown that a water test at each hydrant once in every twelve months is sufficient to keep the doors and spindles of hydrants in working order. There would be no serious objection to the company making a concession of this point, and allowing one free test every six months in order to meet the council's wishes.

3. If it is desired to drill brigades with water more frequently, a special hydrant with a 1-in. meter could be fixed in each district for drilling purposes.

4. If the drills are carried out on a given day in each month, which is the practice of brigades belonging to the National Fire Brigades' Union, the hydrant tests could be carried out on these days.

5. The pressure in the district can be seen at any minute of the year from the automatic pressure recorders. The mains are never shut off from the reservoirs of the company except in cases of accident.

6. As there is a large number of hydrants all over a very large district, tests must be carried out in the presence of one of the company's inspectors, and the inspector must re-seal the hydrants in order that a proper check may be kept, and also to ensure that the hydrants are not left unsealed, as they may then be used for other purposes, such as filling the tanks of traction engines, &c. It is also necessary for an inspector to be present, as occasionally after a hydrant has been opened it is found impossible to again properly shut the valve, the most common cause being a piece of stone or rust getting under the door. This in no way affects the hydrant working from the fire brigade point of view, but prevents the brigade from completely shutting off the water, and the inspector in consequence has to shut down the main to carry out the necessary adjustments. Defects of this nature might occur however frequently tests were carried out.

7. It is necessary for an inspector of the company to see that the hydrants are properly shut down and sealed, as the company is primarily responsible for any accident or damage done due to hydrants leaking.

8. Notice is required in order that the necessary arrangements may be made, and the inspectors' daily routine altered so that they can attend the tests.

9. It must be borne in mind that the company is in no way responsible for supplying water under pressure for the fire-extinguishing purposes. Local authorities only have a right to take such water for extinguishing fires from the company's mains through approved hydrants or fittings as found in the main at the time of the outbreak.

The Hayes Council are sending a letter to the Board of Trade dealing with these contentions in detail.

Cultivation of Lands Order, 1916.

By REGINALD BROWN, M.Inst.C.E., Engineer and Surveyor to the Southall-Norwood Urban District Council.

[Concluded from last week.]

Having got the necessary land and the cultivators to cultivate it, we arrive at the biggest difficulty of all—viz., the seed potatoes. Here, again, it is easy to be wise after the event.

In home-grown food production we, unfortunately, were lamentably deficient, or rather in organisation; but this is only another instance of our "unreadiness"—one could never have foreseen the extent to which this war may be prolonged, and new methods of warfare have more or less interfered with the freedom of the seas. Evidently our means of ascertaining the resources and skill of the Germans were sadly lacking, or, if they were known, they have not been conveyed to the people; or, if conveyed to the people, no notice has been taken.

Be the reason what it may, the fact remains that we have never, evidently, realised that this little island of ours is "tight" in more than one respect; the time has come, however, when we must provide "water-tight bulkheads" to keep the ship of State from being sunk by external influences, and these bulkheads must be operated from within the ship. The crew must be saved at all costs, and the crew must all help to save themselves.

Students of agricultural returns know only too well that the potato crop in 1916 was short by hundreds of thousands of tons, but it was nobody's business to bring the fact home to the people—it wanted a war to do that. The Board of Agriculture would have been blamed if they had dared to have intimated from the house-tops that it was absolutely necessary for these islands to be self-supporting, so far as this was possible. No; it was a matter for the politicians first; but we should be much more satisfied if it could be shown that the advisers to the Board of Agriculture did themselves recommend that Parliament should take steps to give them the necessary statutory authority to put in force necessary measures for food production. As a public official of many years' experience, I cannot believe that it is always the fault of the man in office—it is more often the fault of the system.

The system has got to be altered. The individuality of officials must have full play instead of their recommendations being handed from one to the other, and from one department to the other, and eventually pigeon-holed. Such is system run mad, and hence without responsibility. Look at the Board of Agriculture. How could they move in the matter of food production without powers to see that there was a sufficient nucleus of food? And these powers could only be obtained through another department—the Food Controller. See what the effect of this has been—the board had power given them as to cultivation of lands in December, 1916, but it was not until a large number of local authorities had done a good deal of preliminary work that the Food Controller stepped in and fixed prices for seed potatoes. The Board of Agriculture had certainly taken steps to ascertain likely requirements; but how was this done?

First, each County War Agricultural Committee was asked by the board to ascertain from each local authority in its county the approximate quantity of seed potatoes required, at what station the potatoes were to be delivered, and the name of the person to be held responsible in each district. No promise was made as to quantities or kinds available, or the price to be paid, and as people do not, as a rule, buy a "pig in a poke," there is no wonder that a number of authorities elected to act as their own seed-potato merchants. This was perhaps unfortunate, because it minimised the importance of the board's endeavours. After a good many local authorities had made contracts for supply of seed potatoes, the Food Controller's Order as to fixed prices came into operation, and as the fixed prices were lower than the prices agreed to be paid by the local authorities, it caused mild consternation among some of those who had placed orders.

But not for long—the subtleties of the Order became apparent when it was found that the fixed prices only related to the growers, and not to the merchants, and as one might take it that probably not more than 20 per cent of the potatoes were in the hands of the growers, the prices only governed a small proportion.

The first step, naturally, for a local authority to take was to ascertain from its inhabitants what potatoes were likely to be required, and this necessitated some idea being given as to the kinds available. In the first instance, the author asked through the local Press all those desiring seed potatoes to make their applications on a particular form, and as he had no knowledge of the varieties available he left each applicant to state the kind required. These applications were analysed, and from the analyses six of the most important were selected—viz., Earlies—Sharpe's Express; second earlies—Eclipse and British Queen; and main crop—King Edward, Up-to-Date, and Arran Chief. Quotations were then obtained for these sorts—viz., from private sources and from the board—and, acting upon the information obtained, the author decided to place orders for 31 tons, viz., 8 tons King Edward and 3 tons of Up-to-Date from private sources, and 4 tons Sharpe's Express, 8 tons British Queen, and 8 tons Arran Chief from the Board of Agriculture.

The author in the meantime gave public notice that he appointed a certain day and times for payment by the applicants for seed at the rate of 15s. per cwt. for British Queen, King Edward and Up-to-Date, and 16s. per cwt. for Sharpe's Express and Arran Chief, and it is satisfactory to note that over £400 was taken in cash on the day named, only two out of 400 applicants asking for a little time for payment. The order for King Edward and Up-to-Dates was duly accepted by the seed-potato dealers at a fixed price per ton. The order sent to the Board of Agriculture was altered by the board itself to King Edward 12 tons, Arran Chief 4 tons, and President 4 tons, which, although representing the quantities, by no means represented the varieties ordered.

This uncertainty was breaking faith with those who had paid for earlies and second earlies, and to avoid any such feeling the author again appealed to the cultivators through the Press, told them candidly that the Board of Agriculture could not now guarantee either earlies or second earlies, and gave them an opportunity to have the payments made by them refunded, and if no intimation was received within a certain time, then the order for earlies and second earlies would be automatically transferred to one of the late varieties. At the time of writing the author has had 9 tons of King Edward delivered, and the others are expected daily.

Your readers will note there are three operations—(1) Obtaining the potatoes, (2) distribution of potatoes, and (3) collecting the money from purchasers. The method of obtaining the potatoes has just been given; the method adopted by the author for collecting the money has not been "cash on delivery," but "cash with order." There now remains the method of distribution.

It was suggested in the official circular of the Board of Agriculture that notice should be given to cultivators when the seed might be expected at the station and requesting them to attend, pay for and take away the potatoes supplied to them. It is difficult to see how such an arrangement could have been carried out. One only knows when goods have been delivered at a railway station by the receipt of a consignment note from the railway company that the goods have arrived and requiring removal within two days on pains of demurrage. Again, only a small portion of the potatoes may be "weighted" at one time, because all do not come from the same forwarding station; further, a cultivator may want several sorts, and would have to attend on several days. Then it is doubtful if railway companies would welcome a queue of several hundred people in their goods yard at all hours of the day and evening fetching seed potatoes. No! Such an arrangement is quite unworkable. While agreeing that every one doing his bit must share the work [illegible] the author came to the conclusion that the larger proportion of seed, on delivery, must

be assembled for distribution. While some cultivators required hundredweights of one kind, others required smaller quantities, while others, again, required some of each variety, some in full hundredweights and some in part cwts. The author decided that it would be easiest for all concerned if the full hundredweights were delivered direct to the purchaser's house (the receiver signing for same), and those requiring part hundredweights to attend at the distributing centre, where the bags could be "split."

In some districts the principle has been adopted of having all the potatoes carted to one centre; but here again will be, for instance, the wife of a soldier on active service has to be her own potato-carrier, it is no joke for her to perambulate for a mile or so to get what she wants. The author therefore selected six convenient distributing centres in his district at which the potatoes (except those sent out direct, as above indicated) will be delivered. Each centre controls certain streets, and when all the various kinds of potatoes have been delivered at the centres a notice in the Press will require all persons living in streets controlled by a particular centre, having previously paid for seed, to attend on a certain day at a certain time, when they will have the goods handed over to them.

Before concluding, one need only state that wider powers are now possessed by councils in connection with "taking" land. "Occupied" lands can now be taken under certain conditions, with the consent of the occupier, and if any difficulty crops up then the County War Agricultural Committee may grant permission for the land to be taken. Although the author does not see that the County Committee will be overburdened with work in connection with this matter, still, he is glad to see the power given them, because the mere fact of the power being there will be an incentive to occupiers—and even owners—to part more easily with their land on reasonable terms. Already the author has taken over fifty plots under the "extended" order.

In conclusion, the author would like to state that, to assure the supply of the necessary seed potatoes, the Board of Agriculture, in the opinion of several people, ought to have had power to have commandeered *all* the potatoes in the kingdom, not only in the case of growers, but also in the hands of merchants, and so secured uniformity of price and treatment; but the author is personally of opinion that the board has risen nobly to the occasion, and the energy they have shown in the matter is a good omen for the future of the agricultural industry. "Agriculture is again coming into its own."

TENURE OF ALLOTMENTS.

The President of the Board of Agriculture was asked in the House of Commons if he was aware that the whole value of the powers given to local authorities to seize land for food growing was destroyed by the fact that the land must be handed back by January, 1918, seeing that no allotment holder would take derelict land, dig it, and clean it, to lose it after the first crop. It was also asked if it was possible to make some change by which a longer tenure of occupation can be secured.

The Parliamentary Secretary to the Board of Agriculture (Sir Richard Winfrey): The board do not agree with the statement made in the first part of the question. Over 66,000 plots have already been taken up under the Order, and the demand has by no means been yet fully satisfied. The true position is that the board have said they could not guarantee possession of plots after January 1st next, but it does not follow from that that the plots will have to be given upon that date. The whole question is, however, under consideration, and it is hoped that a further statement on the subject may be made shortly.

Commander Wedgwood: Is the hon. gentleman aware that this difficulty about the surrender of plots is one that engaged his own personal attention three months ago, and has nothing been done yet to secure other arrangements or security of tenure?

Sir R. Winfrey: Yes, Sir. It has engaged my attention, and I hope to make a further statement shortly as to what will be the permanent character.

Commander Wedgwood: Then why is the statement to go out to the public that plots have to be handed back on January 1st?

Sir R. Winfrey: The latter part of my answer states that the whole question is still under consideration, and it is hoped to make a further statement shortly.

Commander Wedgwood: Three months.

NOTES FROM IRELAND.

Specially Contributed by an Irish Correspondent.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Irish Notes," 24 Bride-lane, Fleet-street, E.C. 4.]

District Councils and Direct Labour.

The refusal recently of the rural district councils of Omagh and Cookstown, in South Tyrone, to approve of the proposals brought forward by Mr. J. W. Leebody, the county surveyor, for working certain roads by direct labour, shows very forcibly the conservative nature of district councils in Ireland, and the difficulty which even a very capable surveyor of long experience has in inducing district councillors to adopt new methods, even when it has been proved by the results obtained in other parts of the country that the introduction of direct labour will be followed by better roads, maintained at a lower cost than by the contract system. Mr. Leebody has been very successful in opening and developing quarries in South Tyrone, and the county council of Tyrone own quite a large fleet of rollers and portable stone-breakers; but, while some of the district councils concerned seem to raise no objection whatever to the raising and breaking by a system of direct labour of the stone in the quarries owned by the county council, or to the purchase and working of rollers and portable breakers on the same system, they require all other work in connection with the maintenance of the roads to be done by contract.

* * * * *

No doubt the hauling of the stone can be done very cheaply by farmers at certain slack seasons of the year, and the farmers, who constitute the great bulk of the ratepayers, should get the opportunity of putting a little of the money which they contribute back in their pockets, so that it would perhaps be undesirable to endeavour to employ other means of conveying the stone from the quarries to the roads, but it is in the surfacing of the roads, the spreading off of materials, and the several operations in connection with the steam rolling of the roads, that direct labour shows the best results. Yet it is in regard to these matters that these district councils in Tyrone refuse to approve of direct labour being applied. In estimating for the required surface work on the road the county surveyor for South Tyrone allows a sum of 15s. a week for each man, but the road contractors, when possible, put on old-age pensioners. These men, however, while in receipt of their pensions, cannot earn more than 8s. a week, otherwise they would be disqualified for pension, so that the road contractor in this way makes a clear profit of 7s. a week on each pensioner he employs.

* * * *

Limit of Expenditure.

In spite, however, of the opposition of district councils and road contractors, direct labour is being gradually introduced on the roads in many counties. Under a clause in the Local Government Act the expenditure on roads must not exceed by more than 25 per cent the average amount spent during the three years previous to the passing of the Act in 1899; but under the contract system this limit of expenditure has been reached in many districts. The Local Government Board have power to increase the limit on being applied to, but when the limit is reached district councils begin to feel uneasy about their expenditure, and generally refuse to increase any further the amount allowed for roads in order to induce contractors to tender for them. Contractors, as a consequence, do not come forward to tender, and the roads by degrees drop into the county surveyor's hands, and ultimately a system of direct labour is adopted for a group of roads, or possibly for a particular rural district, or even for a whole county. Among counties in which the limit of expenditure has recently been reached in several districts are Galway and Cavan. In both of these counties the expenditure under the grand jury system was quite insufficient for the maintenance of the

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roads, and the 25 per cent increase allowed under the Local Government Act is still insufficient to maintain them.' In both counties a considerable increase in the limit of expenditure, a system of direct labour, and a sufficient number of assistant county surveyors, devoting all their time to county work, are evidently required, in order that the roads may be brought up to a state suited to modern requirements.

* * * *

Extraordinary Traffic. The recent judgment of the Lord Chief Justice in the Court of King's Bench in the case of the *Meath County Council* v. *Wardell*, is an important one. The defendant, Mr. Wardell, appealed against the decree for £130 granted by the county court judge for damage caused by his traction engine and wagons when hauling material over certain roads in Co. Meath. At present the usual custom in Ireland seems to be, when injury is caused to a road by extraordinary traffic, to wait until the traffic ceases, or, at any rate, until it has proceeded for some time; then, if the person causing the injury does not agree to make good the damage, an action is brought in the county court to recover the amount, certified by the surveyor to the authority bringing the action, as necessary to put the road into the condition it had been in at the time the extraordinary traffic commenced on it.'

* * * *

The Lord Chief Justice, in his judgment, however, said that in his opinion, as soon as the local authority saw substantial injury *being* caused by extraordinary traffic, it was their duty, in the interests of the ratepayers and also of the travelling public, to incur whatever expense was *then* necessary for restoring and keeping the road in a fit and proper condition, and if that expense was above the average expense, and this extra expense was due to extraordinary traffic, then the person causing the damage would be liable for any difference between the amount required to maintain the road under the extraordinary traffic passing over it and the amount required in the normal upkeep of the road. In the case before him this course had not been followed, and he (the Lord Chief Justice) reduced the decree of the county court judge from £130 to £60.

* * * *

The judgment of his lordship may, however, cause some difficulty in dealing with cases of extraordinary traffic in Ireland in the future, because surveyors before making good any damage caused by such traffic have first to see that they will be recouped for any expense they go to. In the case of county surveyors this will entail an application before the district council for the district in which the road is situated, for the amount required, and the adoption of the proposal, for whatever sum the district council may approve, by the county council, and if the extraordinary traffic should proceed for any length of time it may involve repeated applications having to be made to a district council, and consequent delay in making good any damage caused. However, a way out of this difficulty will no doubt be found presently.

THE WAR AND CONTRACTS.

FEWER TENDERS AND HIGHER PRICES.

In December last the Works and Stores Committee of the Metropolitan Water Board were authorised to advertise for tenders for three, six, nine, or twelve months as from April 1, 1917, for the supply of stores and materials, &c., for the maintenance of the water undertaking, and to accept the most advantageous tenders. Where, in their opinion, it was not necessary or desirable to enter into contracts, they were also authorised to make such arrangements with or without tenders as were most advantageous to the board.

In the case of the contract for pipe-laying repairs and alterations and bricklaying work, which had been held for three years ending March 31st last, the committee stated that the chief engineer had advised that, in the present crisis, it was not desirable to enter into fresh contracts, and that they proposed that the work should, for the period of three months ending April 1st, in the first instance, be undertaken by the chief engineer by means of the board's available staff and direct labour. Subsequently, however, the chief engineer expressed the opinion that, owing to the demands of the War Office for the release of more of the board's staff, and the difficulty of securing temporary labour, it might be found impossible for the board to undertake this work, and it was accordingly decided to issue advertisements for tenders, the chief engineer being also asked to submit a tender.

In response to the board's advertisements, only one tender was received, and this contained prices considerably higher than those paid under the expiring contracts. The committee also had particulars submitted by the chief engineer of the prices paid for similar work done by the board.

In view of the war, and having regard to the consequential circumstances affecting labour, the committee adhere to the view expressed to the board in December last, that the chief engineer should undertake this work for a period of three months from April 1, 1917, by means of the board's available staff and direct labour. They have asked him to report upon the matter at the expiration of that period with a view to their considering as to the future action to be taken by the board.

Where the committee were advised that advantageous tenders might be obtained, advertisements were issued for the supply of such stores and materials, &c. Approximately 170 forms of tender were issued and 97 tenders were received. Examination of the tenders revealed a considerable increase in prices in comparison with the lowest contract prices for 1916-17. In view of the continuing abnormal situation on account of the war, and the uncertainty as to how long these conditions would continue to prejudice market prices, the committee have given careful consideration to the question of the period for which the various contracts should be accepted. In some cases they have accepted tenders which, though not the lowest, are believed in the special circumstances to be in the best interests of the board. In the case of certain sections of some of the contracts, the committee are of opinion, in view of the prices received, that it would be against the board's interests to accept a tender, and they will obtain the necessary supplies under the authority given to us by the board.

Local Government Board and the Exemption of Dustmen. A committee of Hammersmith Borough Council addressed a letter to the Local Government Board urging that steps should be taken to place the dustmen employed by the council in somewhat the same position as workmen engaged in contracted establishments under the Munitions Acts as regards exemption from military service. The board have replied that, after consideration of the matter, they do not think the suggestion is practicable.

Institution of Municipal and County Engineers.

EASTERN DISTRICT MEETING AT HOUNSLOW.

Mr. H. F. Wakelam, the district chairman, presided at a meeting held at an Eastern District meeting of the Institution of Municipal and County Engineers, held at Hounslow. In the course of the proceedings, which took place at the Hounslow Council House, Mr. J. G. Carey, the engineer and surveyor to the Heston and Isleworth Urban District Council, submitted a paper in which he furnished an interesting account of the experimental clinker asphalt roads which he had laid on the Staines road, and other business transacted included the nomination of district officers and the appointment of district executive committee for the year 1917-18. Visits to a number of the undertakings referred to in Mr. Carey's paper were made in the course of the afternoon. The attendance at the meeting included Messrs. S. W. Barnes (Hanwell), J. Birch (East Ham), Reginald Brown (Southall-Norwood), T. W. Bennett (Hendon Rural), J. G. Carey (Heston and Isleworth), C. H. Cooper (Wimbledon), A. Dryland (Surrey County), E. Willis (Chiswick), W. Hedley Grieves (Sutton), M. Hainsworth (Teddington), W. R. Hicks (Ealing), R. C. N. Newport (Hendon Rural), W. O. Ord (Croydon), J. Rushbrooke (High Wycombe), J. Stevenson (East Molesey), and J. A. Webb (Hendon Rural).

The members were received by Mr. A. A. Bergin, chairman of the district council, and Mr. Wakelam, in acknowledging the welcome, remarked that the institution always appreciated the presence of members of local authorities at their meetings. The chairman added that regret would be felt at the absence that day of their honorary secretary, Mr. Harrison. They were greatly indebted to Mr. Harrison for the services he had rendered during the past year. He was a most indefatigable secretary, and his absence from the meeting would be regretted by all present.

DISTRICT OFFICERS.

Mr. Wakelam was unanimously re-nominated as district chairman for the ensuing year, it being remarked that the able manner in which he had discharged his duties in the past had gained for him the fullest confidence of the members.

Mr. Wakelam said he greatly appreciated the compliment paid him, and assured the meeting that he would continue to do his utmost in the interests of the institution. Having been associated with it for no less than thirty years, there was no district which he would like better to preside over, and he was glad to know that he would be able to "carry on" for another year.

On the proposition of Mr. Willis, Messrs. J. A. Webb (Hendon Rural) and W. R. Hicks (Ealing) were nominated as district representatives on the council.

The Chairman proposed, and it was unanimously agreed, to re-nominate Mr. P. T. Harrison for the position of honorary district secretary.

The following were elected to form the district executive committee: Messrs. H. T. Wakelam, E. Willis, J. A. Webb, P. T. Harrison, J. E. Sharp, H. Collins, S. H. Chambers, A. Gladwell, W. H. Prescott, H. J. Williams, W. R. Hicks, F. W. Smart, W. L. Jenkins, L. Looper, P. Bennetts, and Brown.

FUTURE MEETINGS.

It was stated that arrangements had been made for a meeting of the district to be held shortly at East Ham.

Mr. Reginald Brown announced also that on April 28th a meeting of the Metropolitan District would be held at the institution offices for the consideration of a paper which he was preparing.

THE ORPHAN FUND.

An appeal on behalf of the orphan fund was made by Mr. Willis, who observed that while the subscriptions from the Eastern District were greater than those of any other district, there was still room for improvement.

The Chairman, supporting the appeal, said of course a great deal had been accomplished, but they ought to be in a position to do more, and having regard to the increase in the demands which were coming in on the funds as a result of the war, it was necessary that something should be done to assist the fund.

A paper entitled "Municipal Works at Heston and Isleworth," was afterwards presented by Mr. J. G. Carey, the engineer and surveyor to the urban district council.

HESTON AND ISLEWORTH MUNICIPAL WORKS.

Mr. Carey observed, in introduction, that the district of which he had the honour to be the engineer and surveyor deserved more attention than that which could be given in the short time at the disposal of the meeting that afternoon. It was the intention that the Eastern District should hold a meeting here, preferably after the war, but as it was imperative that the members should meet this month, he consented, no other place being available, to do his best towards providing and making the meeting a success.

The district of Heston and Isleworth was contained within the two parishes of Heston and Isleworth. Within the area were the village of Heston and the towns of Hounslow and Isleworth. The district extended from Southall on the north to Twickenham and Richmond by the River Thames on the south, and from Brentford in the east to Feltham and Cranford on the west; it had a population of 50,000, an area of 6,893 acres, 57½ miles of roads, and a rateable value of £235,755.

PUBLIC BUILDINGS, ETC.

The council possessed a large council house, two libraries (one Carnegie Library), two public swimming baths, three fire stations, works department, electricity station, refuse destructor, houses for the working classes, sewage disposal works and pumping stations, three recreation grounds, and a riverside promenade. Mr. Carey added that since he was appointed architect and surveyor to the Education Committee in 1909 he had designed and erected two schools, the Central Schools, Isleworth, erected in 1910, for 640 scholars, and the Alexandra Schools, Hounslow, completed in March, 1915, for 840 scholars.

TOWN PLANNING.

Continuing, Mr. Carey said the council had received authority from the Local Government Board to prepare a town-planning scheme extending over an area of 5,547 acres. The area included, in addition to large areas of land which were ripe for development, the country seats of the Earl of Jersey and the Duke of Northumberland. The preparation of the scheme was in abeyance due to the war, but from negotiations which were proceeding there was every reason to believe that, with the cessation of war, two estates, if not more, would be developed on town-planning lines. The district, the author of the paper observed, was well favoured for town planning, as, apart from the size, which was sufficient to provide for garden cities and manufacturing centres, it was healthy, bracing, and pleasantly situated within easy distance of all parts of London, with an excellent electric train service.

Proceeding to refer to the Great West Road, Mr. Carey said this, when constructed, should also assist in development, as (within its length of 3½ miles in the district) it passed through mostly undeveloped land, and it must therefore favourably assist any town-planning scheme.

In addition to the advantages mentioned, the council's electricity undertaking, which now served the major portion of the district, would provide an incentive for the attraction of industry. Further, there were signs of activity on the banks of the Thames at Old Isleworth, and it was hoped that this would continue after the war, and that the River Thames would again carry a share of the traffic from London to the upper parts of the river.

ALLOTMENTS.

On this subject Mr. Carey quoted the following passage from the Prime Minister's recent letter to farmers and surveyors:

"We have now reached the crisis of the war, when to ensure victory the heroism of our armies at the front must be backed by the self-sacrifice and tireless labour of everyone at home. To this end the production of each quarter of wheat and oats, and of each bushel of potatoes, is of vital importance."

He mentioned that because, in times of peace, allot-

ments were but of small moment in the work of a municipal surveyor, but recently all had, no doubt, experienced the rush to cultivate land. The Heston and Isleworth Council had always been sympathetic towards the would-be allotment holders, and had provided 510 permanent allotments, let at prices varying from 7d. to 1s. 2d. per rod, and 973 allotments under the War Agricultural Committee, let at 1s. 6d. per plot of 10 rods or thereabouts. In addition to allotments the council had arranged for the cultivation by market gardeners in the district of 17 acres of waste land. The local market gardeners and other experts had generously co-operated with the council, and given their assistance to the Heston Horticultural Society and a recently-formed Isleworth Allotment Society, which societies the majority of holders had joined, and from which they were obtaining the necessary seed potatoes and chemical manures.

In the next section of his paper—which we reproduce on another page—Mr. Carey gave an interesting account of his experiments in connection with the utilisation of refuse destructor clinker in road-making.

Concluding his observations, Mr. Carey said he regretted the absence of technical details, which would probably have afforded data for discussion. Indulgence in this direction would, he felt certain, be granted when the war and the want of time necessary for the production of such a paper to do justice to the district were considered. For that reason his paper was short, but he hoped that the Eastern District would at some not too far-distant date see fit to meet again in the district, when he would endeavour to meet any shortcomings in this direction.

The Chairman moved a vote of thanks to Mr. Carey for his paper. He knew how little time Mr. Carey had had at his disposal to prepare the contribution, and it was good of him to do what he had done. He had known him for many years, and he knew of no surveyor who had the interests of his district more at heart. He put these before anything else, and he congratulated the authority which he served on possessing such a reliable officer.

Mr. Willis seconded the vote of thanks, and it was carried.

Before separating the members were entertained to tea by the surveyor. It had been arranged that before dispersing the meeting should take up the discussion of Mr. Carey's paper, but time did not permit of this being done, and the proceedings terminated with a vote of thanks to Mr. Carey for his contribution and for the hospitality extended to the members.

NORTH-EASTERN DISTRICT MEETING AT SPENBOROUGH.

A meeting of the North-Eastern District of the Institution of Municipal and County Engineers was held at Cleckheaton, Spenborough, on Saturday afternoon last, when the business included the reading of a paper by Mr. A. Rothera, surveyor and water engineer to the Spenborough Urban District Council, his subject being "A Few Notes on the Duties of a Surveyor." Mr. J. P. Wakeford, of Wakefield, was in the chair, and the members who signed the attendance roll were Messrs. F. W. Spurr (York), G. A. Hart (Leeds), H. Bottomley (Bingley), W. Fowlds (Keighley), A. Rothera (Spenborough), W. T. Lancashire (Leeds), W. Dixon (Leeds), E. H. Burton (Wakefield), hon. district secretary, H. Dearden (Dewsbury), E. J. Silcock (Westminster and Leeds), T. H. Hailstone (Birstall), and J. W. Southwart (Rothwell). The chairman (Mr. J. H. Collier) and several members and all the chief officials of the Spenborough District Council were present. Letters of apology for non-attendance were read from a number of members, one of these being Major W. J. Steele (Newcastle-on-Tyne), who is with the Royal Engineers in France. Major Steele sent his good wishes for a successful meeting, and added, "The work here goes on seven days a week, and while it is sometimes trying and arduous, it is interesting."

Mr. Collier gave the visitors a most cordial welcome, and explained that Spenborough, which appeared neither on a map nor in any railway guide, and which therefore might have given some of them cause for wonder, was a comparatively new combination of the three townships of Cleckheaton, Liversedge, and Gomersal. Originally it had been intended to apply for a charter of incorporation, but "the capacity and zeal for absorbing district council areas" which a neighbouring county borough had displayed had interfered with this intention. He assured them that amalgamations had done away with previous clashing of interests in the three districts, especially so far as sewage matters were concerned. He might add that in Mr. Rothera they felt they had a capable and devoted public servant.

The Chairman acknowledged the welcome, and explained that the attendance that afternoon was not so large as usual, because of the number of their members who were serving in the forces, or were engaged on other forms of national work. He was convinced, he proceeded, that such gatherings were of great educational and practical value. In connection with them, however, there was one thing that always struck him as most unfair and unjust, and that was that municipal engineers should be called upon to pay their out-of-pocket expenses when attending them, especially as they were thereby gaining knowledge for their own authorities. He was satisfied that the objection to paying officials for these expenses never came from the thoughtful members of a council. Whatever those who objected might say, it was absolutely essential that a municipal engineer should keep himself well posted up in what was going on in other towns.

THE DUTIES OF A SURVEYOR.

On the presentation of Mr. Rothera's paper is produced elsewhere in this issue.

The Chairman started what proved to be a very interesting discussion by remarking that Mr. Rothera's procedure with regard to drain connections seemed to be all very well so long as it was not challenged, but he found a good deal of difficulty would be found in compelling a fractious contractor, or owner, or occupier, to make a deposit before laying a drain that was to be connected to a public sewer. His own practice was never to ask for a deposit, because he did not care to take up a position which it would be difficult to maintain. Then with respect to what Mr. Rothera had stated as to the breaking up and repair of private streets, etc., there was no doubt that the whole law with regard to this matter required amendment, and particularly as to the period of maintenance. Six, or even twelve, months was far too short a period for surface reinstatements. His own experience was that even after eighteen months they would notice considerable subsidence consequent on drain repairs.

Mr. W. T. Lancashire (Leeds) said that so far as Leeds was concerned they had not had any difficulties in the matter of prepaying for connections, but it might be that with one in a thousand trouble would occur, and they did not run any risk. Whilst he agreed that it would be a good thing if the Public Health Acts could be consolidated and simplified, there was just a danger that they might lose some useful clauses if they were to stir into the old Acts. He contended with respect to another question Mr. Rothera had raised that the council of their association had done something, and had, in fact, interested itself in the question of minimum salaries.

Mr. F. W. Spurr (York) gave his own personal experiences at York in confirmation of Mr. Rothera's statement as to the great damage done to setts and wood pavings by stud attachments to the wheels of road locomotives, and added that his own authority had taken up this matter with the Local Government Board.

Mr. W. Fowlds (Keighley), on the question of the repair of fence walls alongside public roads, said that in the case Mr. Rothera had mentioned the ruling of the Local Government Board official was to him a most wonderful thing. So far as breaking into streets was concerned, he might say that at Keighley they did not allow a contractor to break into a street at all; and certainly, from the standpoints of the surveyor and the local authority, this was the ideal way.

Mr. W. E. H. Burton (Wakefield) said he knew very well the particular wall which had been referred to; he could say that a proper fence was absolutely necessary to safeguard the public at that point; and it was much to be regretted that the Local Government Board did not see fit to put the onus for the repair of the wall upon one or other of the parties concerned.

Mr. E. J. Silcock (Westminster and Leeds) observed that on this particular question of liability he was not quite sure that the members appreciated the position of the landowner. There was one general matter he would like to refer to at that meeting, and that had relation to unemployment after the war. The preparation of schemes

of private employment on necessary public works should now be undertaken to the greatest possible extent, so that plans would be ready, and it would not be necessary to adopt what might be termed panic measures at the last moment. So far as the council's own position was concerned, he was bound to say that the members themselves were to blame if they did not get all they wanted. They would be surprised at the small number of voting papers which were sent in, and also, might he add, at the small number of votes cast for those whose names appeared towards the end of the list. A man whose name began with W was likely to get fewer votes than a man whose name began with A. ("Hear, hear," and laughter.)

Mr. Bernard replied to a vote of thanks which had been accorded him, and added, in regard to housing and town planning schemes, that many of the members of the institution would be prime movers in any developments, and he urged that they should all try and make themselves living factors. So far as ownership of fence walls was concerned, he gave instances where owners, after objecting to do repairs, had subsequently sent in plans showing that they intended to use the walls for their own private purposes.

OTHER BUSINESS.

Mr. F. Massie (Wakefield) and Mr. J. F. Smillie (Tynemouth) were appointed district representatives on the Institution Orphan Fund (on whose behalf a collection was taken at the meeting). Major Steele and Mr. J. P. Wakeford (Wakefield) were nominated as district representatives on the council; Mr. F. W. Sharp (Yeadon) was chosen as chairman of the district; and Mr. W. E. H. Burton (Wakefield) consented to act as hon. district secretary until the end of the war.

Mr. Collier afterwards entertained the visitors to tea at the town hall.

NORTH-WESTERN DISTRICT MEETING AT MANCHESTER.

Mr. S. S. Platt (Rochdale) presided at a meeting of the North-Western District of the Institution of Municipal and County Engineers, held in Manchester on Monday, and there were present members from Manchester, Stretford, Blackpool, Wigan, Birkenhead, Bury, Warrington, Audenshaw, Hyde, among other towns.

The following were nominated as executive officers for the ensuing year:

District Chairman: Mr. J. S. Brodie (Blackpool).

District Hon. Secretary and representative on the Central Council: Mr. Ernest Worrall (Stretford).

District representative on the council: Mr. J. A. Seed (Bury).

The resignation of the office of hon. secretary by Mr. A. W. Bradley (St. Helens) was accepted with regret, and a cordial vote of thanks was accorded Mr. Bradley for his services over a term of years in that capacity.

The question of augmenting the Orphan Fund of the institution was discussed, and was referred to the district representatives, together with Mr. Brownridge (Birkenhead), a vice-president, for consideration at the next meeting of the stewards, to be held in London.

The president of the institution (Mr. J. S. Brodie, Blackpool) was present, and items of routine business were dealt with.

Efficacy of Waterproofed Cement.—An interesting question as to the efficacy of waterproofed cement has been raised in Australia, the case in point being a dock in connection with England. At high-tide the water almost reaches the top of the retaining wall of the dock, and much trouble had been occasioned owing to the water penetrating the wall. Various methods were adopted to overcome the difficulty, but it was not until use was made of Portland cement that complete success was attained.

Incorporated Municipal Electrical Association.—The general meeting of this body will be held at the Institution of Civil Engineers, Great George street, Westminster, on June 21st and 22nd. On the former day the presidential address of Mr. F. M. Long (Consett) will be given on "Individual Interests in Electrical Undertakings," by Mr. J. H. Bowden (Blackpool). During the morning, while in the afternoon Mr. T. A. Jackson (Salford) will read a paper on "Load Factor." The second day is given up to the annual general (business) meeting, to receive the annual report, elect officers, &c.

INLAND WATER TRANSPORT FACILITIES.

ATTITUDE OF RAILWAY COMPANIES.

In the House of Commons, Mr. Peto asked the Secretary to the Board of Trade (1) whether the Canal Control Committee has only control over the independent canals and not those owned by the railway companies; whether the policy of the railway companies to discourage traffic on all canals which they control is to be allowed to persist in view of the need of using all means of transport available in the country to the fullest capacity; seeing that all traffic has ceased on the Kennet and Avon Canal for the past three months, although there is congestion at Avonmouth and goods are waiting there needed by farmers and others throughout the ninety miles traversed by the canal, will he say what action he proposes to take; and (2) whether the railway-owned canals are under the control of the Railway Executive; whether he is aware that the Kennet and Avon Canal has for some months ceased to carry any traffic at all, that, owing to shortage of rolling-stock, farmers in Wiltshire and South Berks have difficulty in obtaining such things as seed corn and oil for tractors, and that the absence of canal transport facilities is having a prejudicial effect upon food production throughout the ninety miles of agricultural country traversed by this canal; and whether he can take any steps to ensure at once the resumption of traffic on the canal and communication direct between Reading and Avonmouth to its full capacity?

Mr. Roberts said the Canal Control Committee and the Railway Executive Committee had control respectively over the leading independent canals and the railway-owned canals. Both committees were fully alive to the importance, in present circumstances, of utilising canal transport to the greatest extent possible, and were working in co-operation to that end. As regarded the Kennet and Avon Canal, he understood that the canal was, and had been, available for any traffic which carriers were in a position to bring upon it. The Great Western Railway Company were not themselves carriers on the canal.

Mr. Peto asked whether there would not be a better chance of utilising to the full the facilities for water transport in this country if we had one authority now, instead of two committees to deal with it; and, secondly, in reference to that part of Mr. Roberts' answer where he said the Kennet and Avon Canal was available for traffic, was he aware that as a matter of fact, although in time of peace it carried a very considerable traffic indeed, the statement in his (Mr. Peto's) question was perfectly true, and that for three months it had carried none at all.

Mr. Roberts said he was aware of the importance of water transport, and he thought there were indications that the Department were taking steps in order to develop it. In regard to the Kennet and Avon Canal, he understood that the question was one of labour shortage, to remedy which attempts were being made.

At a previous sitting of the House, Mr. Roberts stated that the question of the improvement of canals on demobilisation would not be lost sight of.

The Cleansing and Repair of Sewers.—Manchester Highways Committee are calling attention to the "serious danger and menace to the public health which may arise as the result of the staff being insufficient effectively to cleanse and keep in repair the sewers of the city," and propose that the Local Government Board should be requested to insist upon the inclusion of workmen engaged in "this most necessary service among the reserved occupations."

Supply of Road Materials.—At the last meeting of the executive council of the County Councils Association it was resolved to make urgent representation to the Local Government Board that the limitation of £50 contained in Section 5 of the Highways and Bridges Act, 1891, should be suspended during the war and for twelve months thereafter, it being necessary for purposes connected with the Defence of the Realm that stone, gravel, or other materials for making or repairing highways or bridges, should be obtained from local landowners instead of from distant quarries, whether seaborne or otherwise; and that no person concerned in any such contract shall be disqualified from being elected or acting as a member of any local authority.

Refuse Destructor Clinker in Roadmaking.*

By J. G. CAREY, Assoc.M.Inst.C.E., Engineer and Surveyor to the Heston and Isleworth Urban District Council.

When the writer succeeded to his present position in 1906 he was faced with the necessity of building up several roads in the district, and decided to utilise refuse destructor clinker, which had hitherto been considered a waste product. The method adopted was to scarify and throw out the road surface, spread the clinker, roll to shape, and resurface with the old and new material as required. The results were very satisfactory, for, although in the rolling a considerable quantity of the clinker was reduced to powder, the material proved equally as hard and tenacious as brick or stone rubbish.

From 1906 to 1910 clinker was used for roadmaking, and for filling filter beds at the sewage works. The material was mixed with tar also for patching roads, and as a bottoming for tar-paving. In 1911, and again in 1915, clinker was used for bringing to a level the sites of the Central Schools, Isleworth, and the Alexandra Schools, Hounslow, and in addition tarred clinker was used as a bottoming for the tar-paved playgrounds.

SATISFACTORY RESULTS.

In 1913 the council was so satisfied with the results obtained by the use of tarred clinker that a small mixer was purchased with a view to making further use of the material for roads and footpaths. Up to 1915, with the exception of the material used for the Alexandra Schools, tarred clinker was mostly used for tarpaving and road patching. This was largely due to the extensive road and other contracts then in hand, which prevented any time being given to the production of the material. With the cessation of contracts in the spring of 1915 a sufficient quantity of clinker was manufactured to enable Holloway-street, Hounslow, to be resurfaced. This road is a cul-de-sac, without any traffic of importance, and was chosen to allow the men an opportunity to become accustomed to the handling of the material.

By the spring of 1916 the stock of tarred clinker had again accumulated, and the county engineer and surveyor, Mr. H. T. Wakelam, M.Inst.C.E., was asked to co-operate in the experiments; he readily consented, and obtained the sanction of the Middlesex County Council to the carrying out of experimental resurfacing works with clinker asphalt on the county main roads within this district. The co-operation of the county council has permitted the council to undertake much more extensive experiments than if the total cost had to be defrayed by the Heston and Isleworth Council.

The object of the proposed experiments is to demonstrate whether or not clinker obtained from refuse destructor and stored in a large heap until nearly burned out can be utilised in its varying grades, from impalpable powder to a large size, for the manufacture of a road surface material which will stand the test of time. Experiments with clinker have, as all know, been carried out in recent years by Messrs. Lovegrove, Hornsey; Wood, Fulham; Roberts, Worthing; and Angell, Beckenham, with great success. The experiments in Heston and Isleworth, which, it was hoped, would have been completed last year, have unfortunately for various reasons had to be postponed for a time; when proceeded with it is further hoped that the experiments will be on a line in advance of what has hitherto been carried out.

STAINES-ROAD EXPERIMENTS.

In June, 1916, the county and ourselves agreed to terms, and a contract was let to the Trinidad Lake Asphalt Paving Company, Limited, for the following experimental lengths of asphaltic macadam, to be laid along the Staines-road, which is, in fact, the main road through the district to Aldershot, Southampton, and the West of England.

Section 1.—Approximate area, 2,250 sq. yds. The company to supply and lay 1½-in. bituminous clinker wearing surface, on a tarred clinker foundation to be provided.

Section 2.—Approximate area 2,250 sq. yds. The company to supply and lay a mixture 1½ in. thick of bituminous clinker and sand-wearing surface on a tarred clinker foundation to be provided.

Section 3.—Approximate area 5,000 sq. yds. The company to supply and lay 1½ in. thick of Standard Trinidad Lake asphalt wearing surface on a tarred clinker foundation to be provided.

Section 4.—Approximate area, 1,000 sq. yds. The company to supply and lay direct upon the existing roadway a single coat of bituminous clinker and Kentish rag, 2 in. thick.

In connection with Sections 1, 2 and 3, the contract includes the maintenance of the pavement laid for a period of ten years from the date of completion. Section 4 does not include maintenance, but should this prove successful, the benefits to be derived from it will be greater than those obtained from Sections 1, 2 and 3.

The work involved in section 3 was commenced on August 17, 1916, but perforce had to be discontinued on August 24, 1916, the area covered with Trinidad Lake asphalt during that time being 1,470 sq. yds.

The reason for the discontinuance of the work was owing to the fact that the clinker was found to contain an excessive quantity of tar, which caused too much flexibility in the foundations for the topping, and cracks resulted therefrom. This was proved by the fact that the asphalt surfacing appeared to be more successful where the clinker bottoming obtained from the skirts of the tarred heaps had been used. The latter had to be matured to a great extent by reason of its being in direct contact with the atmosphere.

THE MIXING PROCESS.

In September last it was decided to discontinue cold mixing and to instal a combined drying and hot mixing plant. Terms were agreed with the contractors for the hire of the plant, and it was anticipated that the latter would have been erected and the work resumed last year, but, owing to the Ministry of Munitions retaining the plant until recently, the work connected with its erection is only now proceeding.

In recommending the council to instal the new plant the factors deciding the installation were as follows:

(1) The storage heap was burning for 75 per cent of its area on March 18th, but ceased during August owing to the heavy and continuous rains which fell during that month.

(2) The inability of the refuse destructor to supply sufficient clinker during the summer months; and,

(3) The hot mixing of the material would lessen the amount of tar required, and it is hoped that it will also admit of a lesser thickness than 4-in. consolidated bottoming being necessary.

It may be here mentioned that the ingredients for cold mixing were as follows: 1 cubic yard broken clinker, 12 gallons of tar (to specification), 7 lb. pitch.

(4) The provision of a drying and hot-mixing plant would be of great value to the council owing to the fact that it would admit of uniform results being obtained. Further, it would afford precise information as to the capabilities of the plant to deal with either larger or smaller quantity than can now be obtained by the present methods.

When the work of laying the Trinidad asphalt ceased, about 1,500 sq. yds. of uncoated tarred clinker bottoming remained, which it was decided to coat in two sections, the tarred granite and tarred limestone chips. Unfortunately, the results have not been satisfactory, which was mainly due to the exceptionally heavy rains which fell and penetrated the material whilst it was being laid.

In concluding these short notes on clinker, the writer wishes to express his thanks for the great help and assistance ever readily given by Mr. Wakelam, not only in this instance in which his co-operation has been very valuable, but in all instances which call for discussion and decision as between the county council and the district council.

Mention may also well be made to the great loss he has recently sustained by the death of two of his chief assistants, Mr. C. H. Bradshaw, divisional surveyor, and Mr. J. Williams, chief accountant clerk. The writer has met the former on several occasions.

* Extract from paper read on Saturday last at the Eastern District Meeting of the Institution of Municipal and County Engineers.

and always meet appreciated his genial manner. With Mr. Williams the writer has been connected with the annual audits for about seven years, during this whole of that time and his dealings with the county engineer, the writer and no doubt every surveyor in Middlesex was also struck with the devoted loyalty of Mr. Williams to his chief, the pleasure he took in his work, and his desire to friendly associate to exist between the county council and the district council. We all know that attributes such as these help to establish that good feeling and cordial co-operation which always exist where good government is exercised.

PERSONAL.

Mr. Wm. Watson, borough surveyor of St. Andrews, has received a commission in the Royal Engineers for the war.

Mr. J. C. Dawes, sanitary inspector to the Keighley Urban District Council, has had his salary advanced from £270 to £320 a year.

Mr. W. A. Jackson, surveyor and sanitary inspector to the Meltham Urban District Council, has been called to the Colours.

Mr. A. Rothera.

Surveyor and Water Engineer to the Spenborough Urban District Council.

Mr. Rothera's district was visited on Saturday last by the members of the Institution of Municipal and County Engineers. The excursion being a North-Eastern District Meeting of that body. A report of the proceedings is given elsewhere in this issue.

Mr. David Russell, borough surveyor of Carmarthen, has resigned his position as a technical officer with the Ministry of Munitions in France.

Mr. W. Yo[illegible], engineer to the Lynton Urban District Council, has joined the Forces and Mr. A. J. Medlicott, of Combmartin, has undertaken to devote his spare time to the duties of surveyor.

Mr. W. Fitzgerald Jones has been appointed temporary assistant surveyor and inspector of nuisances to the Carnarvon Rural District Council, in succession to the late Mr. E. L. Wayne, at a salary of £200 a year.

Mr. H. Leavitt, surveyor to the Mottord and Eastbourne Rural District Council, has received a commission in the Army, and the council have granted him a retaining fee of £40 a year during his absence.

Mr. W. J. Cowan, temporary surveyor to the Romford Rural District Council, has been appointed temporary Second Lieutenant in the Royal West Surrey Regiment, and will be [illegible] officer for work on roads and buildings in France. Mr. T. Alderson, assistant surveyor and engineer to the district council, has been granted leave of absence, and has been appointed temporary Second Lieutenant in the Royal Engineers.

Mr. Robert H. Bicknell, M.Inst.C.E., of 16 Victoria-street, Westminster, has, in conjunction with Mr. Chas. S. Meik, M.Inst.C.E., recently completed a survey of the outfall of the river Welland for the Black Sluice Commissioners, and has reported as to the probable cost of increasing the discharging capacity of the outfall and the results that such increased capacity would have on the fen drains discharging into the Welland.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATIONS FOR LOANS.

Chester T.C.—£11,500 for a new electricity cable and the building of a sub-station.

Rotherham T.C.—£1,750 for the purchase of a site for housing purposes.

Todmorden T.C.—£256 for water supply extensions.

LOAN SANCTIONED.

Lancaster T.C. — £2,000 for two additional motor 'buses.

FORTHCOMING INQUIRY.

APRIL.	£
11. **Merthyr.** For the construction of a sewer (Mr. P. M. Crosthwaite)	2,700

FOR OTHER ADVERTISEMENTS

See End of Paper.

BOROUGH OF DONCASTER.

APPOINTMENT OF STOREKEEPER.

Applications are invited for the position of Storekeeper, at a commencing weekly wage of 35s.

Particulars and list of duties may be obtained from the undersigned, whom applications must reach on or before Wednesday, April 18th, 1917.

R. E. FORD.
Acting Borough Surveyor.

Mansion House,
Doncaster.
April 4, 1917. (3,378)

GOSPORT AND ALVERSTOKE URBAN DISTRICT COUNCIL.

The Council invite Tenders for the Supply of the following Materials, &c., as required, until March 31st, 1918:—

Artificial Paving Stone.
Broken Stone for Macadamising.
Brooms, &c.
Castings.
Cement and Lime.
Disinfectants.
Repairs to Firemen's Boots.
Forage.
Fuel, Coal, Coke, &c.
Gravel, Sand, &c.
Harness Repairs.
Haulage.
Hospital Necessaries.
Ironmongery.
Kerb and Channel, Setts, &c.
Masons' Tools, Repairs, &c.
Stoneware Pipes.
Shoeing Horses.
Printing.

Specifications, Form of Tender, &c., may be obtained from the Surveyor to the Council, Town Hall, Gosport, and will be forwarded on receipt of stamped addressed foolscap envelope.

Tenders, sealed and endorsed "Tender for ——," as the case may be, should be delivered—with any necessary Samples—at the Offices of the Council, not later than noon on Thursday, 12th April, 1917.

The Contractor will be required to enter into an undertaking to pay all workmen at least the standard (minimum) rate of wages, and observe the hours of labour current in the district.

The Council do not bind themselves to accept the lowest or any Tender.

H. R. MANGNALL,
Clerk to the Council.

Council Offices, Gosport.
April, 1917. (3,379)

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Bolton T.C.—It is proposed to erect cash and inspector's offices in Trinity-street in connection with the tramways, with a verandah for passengers in waiting.

Middlesbrough T.C.—The borough engineer, Mr. S. E. Burgess, has prepared a scheme for a maternity and child-welfare centre, at an estimated cost of £3,350.

HOUSING AND TOWN PLANNING.

Dudley T.C.—Reporting recently a sub-committee stated that 265 houses had now been completed, and were practically ready for occupation. In the remaining thirty-five houses to be erected under the corporation's scheme there was but little work to be carried out. The number of houses now occupied was 101, and let but not occupied ten. The grant by the Ministry of Munitions was subject to a condition that the houses would be available for the workers at a specified factory, and that they should have a prior claim to them, both as tenants and lodgers, during the period of the war. The condition of the roads and approaches to the houses was retarding the letting. The amounts paid to date in connection with the scheme were: Land, £14,215; buildings, £70,925; roads and sewers, £6,391. The amount of grant received from the Ministry of Munitions was £18,332; paid in interest and sinking fund on borrowed capital, £1,959; and the amount of rent collected, £774.

MOTOR TRANSPORT.

Auckland R.D.C.—Consequent upon scarcity of tenders for carting materials the surveyor, Mr. J. Heslop, has been instructed to report on the feasibility of motor traction.

Eastleigh U.D.C.—Provision is to be made in the next estimate for the purchase of a tarring machine, at an estimated cost of £85.

Nuneaton T.C.—The Electricity Committee reported having considered the question of introducing motor haulage, but after reviewing the position decided that no action be taken.

South Shields T.C.—The tests took place last week of the new Leyland motor fire-engine purchased by the corporation for £1,973. The engine has four cylinders and a 400 to 500-gallon turbine pump designed for heavy commercial work, and developing 48 to 60 h.p. It is capable of throwing 580 gallons of water per minute at a pressure of 80 lb. per square inch from the hydrant, and the whole of the machinery and apparatus is so designed that one man can take full charge when driving on the road, and in addition can take control of both the engine and pump when working at a fire.

Tynemouth T.C. Satisfactory trials were made last week of the new motor engine purchased by the town council from Messrs. John Morris & Sons, of Manchester. It is a four-cylinder engine of 75-h.h.p., and has a 500-gallon turbine fire pump with hose tender combined. There is fitted to it a 40-gallon first-aid equipment for dealing with small fires. This consists of a cistern connected to a reel with 150 ft. of rubber hose piping and is operated by a small pump, which is quite independent of the large fire pump. The great majority of fires can be adequately dealt with by the first-aid equipment without getting the large hose to work. Another feature is a 50 ft. Ajax patent sliding carriage fire escape with emergency extension ladders to reach 60 ft., and a set of folding pompier ladders. The machine is capable of carrying a crew of fourteen men and 2,000 ft. of hose.

REFUSE COLLECTION AND DISPOSAL.

Birmingham T.C.—As regards after-the-war work, the Refuse Disposal Committee are prepared to recommend the city council to go forward with several important and expensive schemes. They suggest the reconstruction of the Montague-street destructor and depot, at a cost of £33,000, and those at Shadwell-street, at an expenditure (including land) of £24,000. A new depot and destructor are proposed at Witton, at a cost (including land) of £36,000, an additional destructor and depot at King's-road, costing £11,000, and at California £7,000. These works will extend over from six to twelve months.

ROADS AND MATERIALS.

Barnet U.D.C.—The council have accepted a tender at 6s. per yard super. for making up with tar-macadam a portion of High-street, and it has also been agreed to continue the macadam from Moxon-street to the tram terminus, this portion to be done by direct labour.

Birmingham T.C.—The Public Works Committee have submitted a large number of schemes of road widening after the war. The most expensive projects relate to the widening of a road from Lordswood-road to Ravenhurst-road, £17,450 (including land), and five roads to Quinton, £30,678, with £3,241 for land purchased. The improvement of four roads to California will cost about £25,000, and the widening of Salford Bridge-road from Wheelwright-road to Holly-lane is estimated at £14,035.

Camberwell B.C.—A committee recommend that it be an instruction to the borough engineer, when ordering or fixing new, or repairing or repainting old, street name plates, to add the district number of the office of delivery, in addition to the initials of the postal district.

Crickhowell R.D.C.—It was reported that the surveyor, Mr. F. Hurley, had had an interview with Mr. A. E. Brocker, who represented the Road Board in the construction of military and inter-camp roads, regarding the damage arising out of timber traffic conducted by the Home Grown Timber Committee. An inspection was made of all the roads affected by this traffic, and he was to submit estimates of the cost of repairs as compared with normal conditions. The Road Board wished to impress upon the council the urgent national importance of doing all in their power to keep the traffic going and as distinct from the requisitions referred to to cover repairs while traffic was proceeding; they would, it was added, consider further requisitions for reinstatement when the traffic ceased.

Littlehampton U.D.C.—The council have accepted the tender of Mr. H. Harris for street watering at 1s. 4d. per hour for man and horse, and for carting flints at 1s. 3d. per cubic yard.

Melton Mowbray U.D.C.—It has been agreed to carry out on behalf of the county council the tar-spraying of the Nottingham, Leicester, Grantham and Oakham main roads, at one penny per square yard.

Monks Kirby R.D.C. The surveyor, Mr. A. J. Ross, having reported in favour of tar-spraying, has been instructed to prepare particulars with a view to an application being made to the Road Board for a grant.

SEWERAGE AND SEWAGE DISPOSAL.

Alcester R.D.C.—The sanitary surveyor, Mr. C. B. Machin, has been instructed to open and cleanse the sewers in Alcester, of which two miles are so silted up that the sewage is 3 ft. above the invert of the sewer in the manhole. Mr. Jas. Caines' "Haulrite" cleansing machine has been successfully tried, and will be used.

Birmingham T.C. The sewerage works contemplated after the war include Erdington main, £33,000, and Lichfield-road, £15,000.

Ellesmere Port U.D.C.—The surveyor, Mr. J. M. Hudson, has received instructions to report on the cost of laying a sewer along Cromwell-road to the gasworks.

Luton R.D.C. The surveyor, Mr. H. Pickering, has been asked to prepare an estimate of the cost of a sewage disposal scheme for Limbury.

WATER, GAS, AND ELECTRICITY.

Aylesbury T.C.—The town council propose shortly to discuss the question of additional plant for the electricity works.

Birmingham T.C.—The Water Committee propose, after the war, to complete the service reservoir at Higgin's Heath, which was stopped by the war. The original contract was £16,652, and the balance of work remaining to be undertaken is estimated at £11,280. New works at Whitacre and Plant's Brook Station, in consequence of the reintroduction of water from local sources as a supplementary supply, is estimated to cost from £15,000 to £20,000, and the supply to the new electric generating station, Nechells, will cost £2,750. The principal project, however, is the provision of the third main on the Elan Aqueduct and works connected therewith. The estimated expenditure, which has been authorised, is £700,000, and the work will take upwards of three years to complete. The gas department propose the construction of gasholder tanks and holders and railway sidings upon the site of the new gasworks at Washwood Heath, at an estimated cost of £250,000. The reconstruction of gasworks at Windsor-street (which may be necessary during the current year) will cost £160,000, and miscellaneous repairs, renewals, and alterations on gasworks £50,000, and these sums will be paid out of revenue. Extensions, renewals, and alterations of mains in area of supply, and the provision of governor houses will involve a total expenditure of £150,000, and this money will be paid chiefly out of revenue.

Leyland U.D.C. It has been decided to accept the amended tender of Messrs. Thos. Kearsley and Son, amounting to £5,856, for carrying out additional works of water supply. Mr. John Parker has been appointed clerk of works at a salary not exceeding 4½ guineas a week.

Mexborough U.D.C.—The council have completed the purchase of the undertaking of the Mexborough and District Water Company for £19,980, and entered into possession of the property.

Perth T.C.—At a depth of 245 ft. rock has been reached in the artesian boring made at Perth in an endeavour to obtain a supplementary supply of water. It is now believed that artesian wells will go a long way towards solving Perth's water problem.

Preston R.D.C.—A scheme has been approved for the extension of the water main along Marsh-lane at an estimated cost of £107.

Rathmines U.D.C.—The charges for electric current have been fixed as follows: For lighting, all classes of consumers, 6d. per unit; heating and other domestic purposes, 3d. per unit; power and cinematograph lanterns, 2d. per unit. Shop accounts to be subject to a discount of 5 per cent.

Rotherham T.C.—The question of the utilisation of the Ulley water supply is still under consideration. Two further reports have been received from Dr. Houston, and the acting borough engineer has given a description of the treatment of the water by sterilisation. The Water Committee approve of the principle of utilisation, but recommend that the settlement of the question of sterilisation be adjourned to a special meeting to be held on the receipt of reports from Dr. Houston.

Torquay T.C.—The borough electrical engineer has submitted a report on the proposal for linking up the electricity works in Devon and Cornwall. While the opinion was expressed in the town council that States aid would be required, it was agreed to go into the matter and prepare a scheme.

MISCELLANEOUS.

Bradford T.C.—Some interesting figures showing the working of the corporation tramways during the past year have been presented to the committee by the general manager (Mr. C. J. Spencer). The receipts amounted to £368,589, an increase of £13,847 on last year, which is equal to 4 per cent. The passengers carried numbered 76,870,642, or 2,787,020 more than the previous twelve months. The mileage was 6,599,013, a decrease of 113,067, and the receipts per car mile were 13·72d., an increase of 7·8d. The total units of electricity used were 12,422,950, a decrease of 12,729. The total wages paid in the department, including war bonus and allowances to dependents of men serving with the colours, amount to no less than £315,151, which is an increase of £19,234 on last year, or 14 per cent. The amount paid in war bonus was £22,087, an increase of £14,962 on last year, and for dependents' allowances £14,376, an increase of £6,038. Notwithstanding the large increase of receipts, the position of the trams (says the *Yorkshire Post*) is not too rosy. Against the increased receipts must be placed the larger amount paid in increased wages, war bonus, and dependents' allowances, whilst with the conclusion of hostilities the department will have to tackle the problem of bringing the track and rolling stock into an efficient state, which will no doubt involve a large expenditure.

Eastbourne T.C.—The acting surveyor reports that owing to the prevalence of easterly winds and heavy seas considerable erosion has taken place at Langney Point, and the centre portion of the western groyne was washed away. This was followed by the curved groynes protecting the valve chamber being completely undermined and washed away. Most of the material has been recovered, and he is having the damage made good as quickly as possible.

Keighley T.C.—It was reported that the question of linking-up the tramways between Keighley and Bingley would be discussed with the Bradford municipal authorities at an early date.

Liverpool T.C.—Mr. C. W. Mallins, in his report on the municipal tramways for last year, states that operations were carried out under very strenuous conditions owing to the depletion of the staff and the difficulty of obtaining material. Out of a total staff of 2,700, 1,900 had joined the Forces, and 100 had given their lives in defence of their country. During the year the increase in the traffic receipts was £41,428. The average earnings per car-mile was 13·97d., against 13·20d. for 1915. Owing to a demand for an increase of 20 per cent, followed by a further increase in the price of tickets, a printing plant had been installed by the committee, and the result was an ample supply of tickets at a much less cost than that demanded by the contractor.

Nuneaton T.C.—The Highways Committee reported having had under consideration a proposition that the council should consider the advisability of immediately promoting a Bill in Parliament for a municipal system of transit after the war, and it was decided that the matter should be discussed by the council.

Oystermouth U.D.C.—The question of growing beet, parsley, and other vegetables in the park this year, instead of flowers, has been referred to the Parks and Foreshore Committee.

Torquay T.C.—Subject to the approval of the medical officer of health and water engineer, as to the lands to be cultivated, and to safeguard the purity of the water, the town council have decided to allow additional land to be cultivated in the vicinity of their Tottiford, Kennick and Trenchford storage reservoirs.

Wayleaves.—A paper on this subject will be read on Thursday next, at 6 p.m., by Mr. C. Vernier at a meeting of the Institution of Electrical Engineers. The proceedings will take place at the Institution of Civil Engineers, Great George street, Westminster.

A Waste-paper Collection Difficulty.—On the receipt by the Droxford, Hants, Rural District Council of the recent circular of the Local Government Board on the subject of waste food and waste paper, a member remarked that a great deal of waste paper had been collected in the district, but the difficulty was to get the bags returned. The result was that nobody had any sacks or bags to put the waste paper in. Whoever received the waste paper could get a great deal more if they would only send the receptacles back.

Coal from Coke Breeze.—The acting surveyor to the Eastbourne Town Council has reported as follows: "Several weeks ago Mr. Goulbern Lovell interviewed me regarding the possibility of manufacturing cheap coal locally from coke breeze, as is now proposed at Birmingham. I suggested that if a satisfactory coal could be manufactured from waste products, such as refuse ashes or destructor clinker, it would probably meet with more acceptance by the corporation. The inventor has therefore made several experiments with local material. It is estimated that the cost of producing this coal locally would be about £1 per ton. This matter is submitted as being of national importance, capable of far-reaching results, and worthy of further consideration."

STREET DANGERS.

LONDON "SAFETY FIRST" COUNCIL'S CIRCULAR TO LOCAL AUTHORITIES.

The Street Dangers Committee of the London "Safety First" Council has had under review several points of practice to which its attention has been drawn, and, in connection therewith, has forwarded to local authorities in the Greater London area a circular containing the following suggestions:—

(1) STREET REFUGES.

The committee suggests that, following a representation made to a local authority by the police for the provision of a street refuge, before a permanent structure is constructed, a temporary portable refuge should be placed on the site, so that its effect on the traffic and general use by pedestrians might first be noted; that the type of refuge with passage-ways for mailcarts, perambulators, &c., at the carriage-way level should be adopted; that, for the protection and safety of those using the refuge, a guard post should be placed at each apex thereof, and an additional guard-post provided at every point where the local authority deems it expedient, but in no case should a guard-post be nearer the outer edge of the kerb than 2 ft.

(2) POSITION OF LAMP COLUMNS.

It is suggested that street lamp columns should be placed as near as possible to the corners of streets, but not nearer than 2 ft. of the kerb, where the width of the footpath permits.

(3) LIGHTING OF STREET OBSTRUCTIONS AT NIGHT.

It is suggested that, except in cases of openings made by tramway authorities, watchmen's lamps at the ends of trenches transverse to the direction of the traffic or obstructions in main roads, should not be more than 4 ft. apart, nor more than 4 ft. in height from the surface of the carriage-way, and that illuminated warning boards inscribed "Beware of obstructions," or other suitable wording, should be utilised where possible.

(4) SNOW CLEANSING.

It is suggested that owing to the shortage of labour occasioned by the war, metropolitan borough councils should invite the co-operation of householders to undertake, following each fall of snow, the cleansing of the paths in front of their houses, as well as of the channel or gutter, to the width of about 12 in., so that, when the thaw occurs, the water may drain into the street gullies. It is also suggested that local authorities outside the County of London should be asked to enforce their powers in regard to the cleansing of footpaths by householders.

(5) WHITENING OF KERBS.

The committee suggests that so long as the restricted lighting regulations remain in force, local authorities should undertake the whitening of kerbs at street corners and road-refuge corners, and that an appeal should be made for the voluntary assistance of householders in the whitening of the kerbs of crossings in footways. In this connection the committee is advised that the waste of carbide of calcium (where it can be obtained) is found to be efficacious for the whitening of kerbs, but care should be taken to avoid the use of slippery material for this purpose.

The committee asks to be favoured with any observations councils may care to offer in regard to the foregoing suggestions.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Food and Coal Distribution by Local Authorities. Replying to a question in the House of Commons last week, the Secretary of the Local Government Board stated that local authorities had at present no statutory powers in the matter of the distribution of food and coal, but if the Government decided that the intervention of the local authorities was desirable Lord Rhondda would be happy to afford any assistance in his power. It being pointed out that in any case where local authorities desired to take action at present they would not be allowed to do so, as it would be outside the law, Mr. Hayes-Fisher said they must take the consequences of their action.

SOME RECENT PUBLICATIONS.*

PAINTING BY IMMERSION AND BY COMPRESSED AIR. A Practical Handbook. By Arthur Seymour Jennings, F.I.B.D. Price 10s. 6d. London: "The Managing Engineer."

Mr. Jennings is a well-known authority on all questions relating to painting and decorating; but this book deals with the subject of painting by scientific methods for the purpose of preservation rather than decoration, and it treats the whole subject in a most practical manner. Mr. Jennings points out that the old method of applying paint by means of the brush is often unsatisfactory and expensive, and that by immersion, or spraying, the paint is more evenly distributed; not only is time saved, but one man can easily do the work of from five to ten men, according to the area and accessibility of the structure to be painted. In whitewashing, the whitewash, when sprayed, enters and covers open joints and irregularities of surface in a manner that is impossible with a brush. The author gives details of the methods employed in spraying and immersion, and the requirements of a good paint, types of spraying apparatus, stencilling, and a host of hints and particulars which are invaluable to anyone who is contemplating this more modern method of applying paint than by means of the hog-bristle brush. The book contains no fewer than 267 illustrations, and we recommend it to the notice of borough surveyors, architects, engineers and others.

LOCOMOTIVES ON HIGHWAYS.

THE NEEDS OF AGRICULTURE.

At the last meeting of the executive council of the County Councils Association, the receipt was reported of a letter from the assistant secretary of the Local Government Board dealing with the use of road locomotives for agricultural purposes.

From information before him (the letter stated) it appears probable that there are a number of locomotives in this country which would be available for agricultural purposes except that in certain respects the driving wheels of the machines do not precisely comply with the requirements of the sub-section above-mentioned and the orders made under sec. 9 of the Locomotives on Highways Act, 1896. It has been suggested that for the period of the war all agricultural locomotives might be so far exempted from the requirements of sec. 28 (4) of the Act of 1878, that it would not be necessary that the driving wheels if shod with diagonal cross-bars should comply with the requirements of the sub-section in respect of the width, thickness or extent of the cross-bars or of the width of the space intervening between such cross-bars. While he is extremely anxious that the roads should not be unnecessarily damaged, Lord Rhondda feels strongly that no unreasonable obstacle should be placed in the way of those who can assist the increase of the national food supply in the present emergency, and he will be glad of the observations of the County Councils Association on the subject at an early date.

A sub-committee of county surveyors, composed of Mr. H. T. Wakelam (Middlesex), convener; Mr. A. Dryland (Surrey), Mr. R. S. W. Perkins (Isle of Ely), Mr. W. H. Schofield (Lancs), and Mr. J. Willmot (Warwickshire), to which the above communication had been referred by the Parliamentary Committee, was empowered to confer with the Local Government Board, and instructed that the proposal made by the board could only be agreed to as a temporary measure, and on the understanding that no serious damage would be done to the roads. Subject to these considerations, the committee desired to facilitate the use of mechanical tractors for tillage operations.

Following consideration of the report on the matter the executive committee approved of a resolution drawing the attention of the board to the serious damage that has recently been caused to roads by the use of studs on locomotive wheels, and to the need for such damage being made good out of national funds.

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* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

MUNICIPAL PIG-KEEPING SCHEMES.

IRISH L.G.B. CIRCULAR TO LOCAL AUTHORITIES.

The Local Government Board for Ireland have issued a circular letter bringing under the notice of sanitary authorities in that country an extract from the Order in Council in regard to a relaxation of local by-laws relating to pig-keeping with a view to facilitating an increase of the food supply of the country. In dealing with the matter sanitary authorities, they say, would do well to be guided by the advice of the medical officer of health as to the limits within which the concession may be granted without detriment to public health, with special reference to the case of premises which may be so situated as not to admit of the removal of manure otherwise than through a dwelling-house.

Dr. Buchan, medical officer of health for Willesden Urban District, having reported that nine tons of waste food and other organic refuse could be collected in the district, the council have decided to use one of their vans for the purpose, and to keep pigs at the isolation hospital and sewage farm.

After a conference with thirty pig-keepers the Eastbourne Corporation Sanitary Committee agreed that the limited time at present permitted for the collection of pig food is too short for increased collection, and it was suggested that the time should be extended in the mornings to 11 a.m., all the year round, and in addition be granted in summer time from 6 to 9 p.m. It was agreed that if a list is prepared by the acting borough surveyor of the houses where householders are willing to keep pig food separate, the pig-keepers will undertake the collection therefrom.

A special committee appointed by the Littlehampton Urban District Council to go into the question of pig-keeping submitted last week a plan entailing an expenditure of £100 for sites. Mr. Tester, who moved the approval, said he thought the scheme would succeed, and that the council would be wise to make a start with it, and the sooner the better. It was proposed to breed pigs and sell to allotment holders. By adopting the scheme the council would be helping to win the war, and on this ground the expenditure was fully justified. Mr. Butt added that there was a project to keep a few pigs in the isolation hospital grounds for fattening. Mr. Denyer supported, and anticipated profitable results. The report was adopted.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Edward Whitwell, F.I.S.E., M.S.A., Engineer and Surveyor, Abersychan Urban District Council.

EASTERN AND NORTH-EASTERN DISTRICTS.

An Eastern and North-Eastern District meeting of the Institution of Municipal Engineers will be held at Peterborough on Wednesday, April 18th.

Programme.

12 noon.—Meet at City of Peterborough Electricity Generating Station, and inspect works, by kind permission of the engineer.

1 p.m.—Adjourn for lunch.

2 p.m.—Visit to Messrs. Barford & Perkins, Limited, Engineering Works, by kind permission of Mr. J. G. Barford.

Visit to City Museum if time allows.

4 p.m.—District meeting at Swiss Café, Narrow-street, when a paper, "Experiences in a Low Rural District," will be read by Mr. A. W. Brooker (district chairman).

Tea.

G. Bellson Chilvers,
Hon. District Secretary.

Guildhall, Northampton.

GENERAL MEETING IN LONDON.

At a general meeting of the Institution of Municipal Engineers to be held in London on June 6th, Mr. Reginald Bloomfield, M.I.S.E., engineer and surveyor to the Southgate Urban District Council, will present for discussion a paper entitled, "House Building: Its Cost, Value and its Possibilities."

The meeting will be held at 6.30 p.m.

SNOW CLEANSING.

THE USE OF SALT ON TRAMWAY TRACKS.

The Works Committee of Camberwell Borough Council report that they have been informed that, in view of the interference with the traffic of the tramways owing to the use of salt following snowfalls, the London County Council are desirous of making certain experiments. The county council had asked permission for the borough engineer, Mr. W. Oxtoby, to co-operate in the investigations, and the committee had given their consent.

The committee add that they have informed the county council that salt is not used in Camberwell for snow-melting purposes.

North Dublin Housing Scheme.—An extensive scheme of housing on the north side of the city of Dublin is at present the subject of investigation by the Corporation Housing Committee. A report dealing with the matter has been prepared by the Housing Committee. It has been decided to draw up a survey of the north side of the city, with a view to formulating a comprehensive scheme of housing for the entire north city area.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, but those responsible for their despatch are recommended to arrange that they shall reach The Surveyor office by noon on Wednesdays to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SURVEYOR.—April 8th.—Elland Urban District Council.—Mr. J. Clarkson, clerk, Council Offices, Elland.

BOROUGH ENGINEER'S CLERK.—April 8th.—Borough of Royal Leamington Spa. £2 per week.—Mr. John J. Kennan, borough engineer, Town Hall, Leamington Spa.

TEMPORARY INSPECTOR OF NUISANCES.—April 9th.—Wantage Rural District Council. £160 per annum.—Mr. E. B. Ormond, clerk, Rural Council Offices, Wantage.

TEMPORARY SURVEYOR AND SANITARY INSPECTOR.—April 10th.—Ashton-upon-Mersey Urban District Council.—Mr. J. W. L. Foulkes, clerk, Ashton-upon-Mersey.

BUILDING INSPECTOR.—April 10th.—Corporation of Bootle. £120 per annum, plus war bonus.—Borough Engineer, Town Hall, Bootle.

TEMPORARY ENGINEERING AND SURVEYING ASSISTANT.—April 11th.—Bootle Town Council. £2 per week, with war bonus.—Mr. B. J. Wolfenden, borough engineer and surveyor, Town Hall, Bootle.

SURVEYOR.—April 17th.—Crediton Rural District Council. £150-£175, with £25 for the provision and upkeep of a motor cycle.—Mr. William Pope, deputy clerk, 31, High-street, Crediton, Devon.

TRAMWAYS TRAFFIC SUPERINTENDENT.—April 23rd.—London County Council. £500 to £700 a year.—The Clerk, London County Council, Spring-gardens, S.W.

ELECTRICAL ENGINEER. April 23rd.—London County Council. £1,200 to £1,500 a year.—The Clerk, London County Council, Spring-gardens, S.W.

MUNICIPAL ENGINEER.—May 1st.—Municipality of Lahore, India. £1,000—£1,600 per annum.—Mr. H. P. Tollinton, deputy commissioner and president, Municipal Committee, Lahore.

TRAMWAYS DEVELOPMENT SUPERINTENDENT.—May 7th.—London County Council. £500 to £800 a year.—The clerk, London County Council, Spring-gardens, S.W.

ROLLER DRIVER.—Ripon Rural District Council. 36s. per week.—Mr. J. W. Plewes, 6 Firs-avenue, Ripon, Yorks.

ASSISTANT SURVEYOR'S OFFICE.—Ulverston Urban District Council.—Mr. C. Tolford Hague, surveyor, Town Hall, Ulverston.

ASSISTANT ENGINEER.—Public Works Department, Nigeria. £300-£400 a year.—Crown Agents for the Colonies, 4, Millbank, London, S.W.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Activated Sludge v. Tanks and Filters.

New discoveries are always viewed with scepticism until their efficiency has been proved and their cost compared with that of existing methods. This applies to the activated sludge process in the treatment of sewage, and although the principle and its efficiency under normal conditions has been proved, no definite figures have hitherto been published to show its cost compared with that of the system of tanks and filters at present in general use. One of the reasons for the lack of this information has been that the experimental work which has been proceeding for some time past both here and in the United States has shown the possibility of reducing the cost of operation by improved methods of design and working, and it is probable that the limit to which the volume of air required can be reduced has not yet been reached, although it is already much lower than the original estimates. Another reason was the absence of two exactly comparable installations. At the same time, it is so important to have some information on these points at the earliest opportunity, that the article on another page should be of considerable interest and value. In this article, for which we are indebted to our esteemed contemporary the *Contract Record*, of Toronto, details are given of a paper, read by Mr. Harrison P. Eddy before the Western Society of Engineers, containing a comparison of the respective costs of the two alternative methods of sewage treatment and an analysis of their individual advantages and disadvantages. It makes most interesting reading, as the figures are given in great detail, and include the unit costs for each item per head of population and per million gallons per day. A careful perusal of the whole paper shows that the author has dealt with the subject in an impartial manner, especially when the notes at the end of the paper are taken into consideration. It is also made clear that, as with older methods in the past, no one particular system or process is suitable for all conditions, and that the engineer will still have to use his judgment in designing sewage disposal works to suit varying conditions.

The author rightly points out that, although the activated sludge process appears to be somewhat more expensive than the system of tanks and filters, it should not be rejected on the ground of cost without giving full consideration to its advantages. Among these we think that more importance should be given to the relative areas of land required. In the figures given both methods are assumed to require the same area, and its cost is taken at about £42 per acre. The reduction in the area required by the activated sludge process will probably have a greater bearing on the subject in this country, where land is seldom available at the price mentioned above. Then, again, the small loss of head in the activated sludge plant may obviate the necessity for pumping the sewage, and the reduced risk of nuisance from smell may in some cases be a great advantage. In connection with the quality of the effluents, the author is evidently satisfied that the effluent produced by the activated sludge process is much superior to that produced by filters, but he is of the opinion that this fact alone should not cause the more expensive process to be adopted, when the results produced by the cheaper process satisfy all requirements. In this connection we think that the adaptability of the activated sludge process in meeting varying requirements should prove of great value. If a less highly oxidised effluent, and a smaller reduction in the number of bacteria, will satisfy the needs of the case, the cost of operating the activated sludge process can be reduced without difficulty. On the whole, we agree with the conclusions at the end of the paper, and hope that investigations will be continued until the process is perfected and all its possibilities are thoroughly worked out.

* * *

Engineers and Foreign Languages.

The council of the Institution of Civil Engineers has issued a circular to members informing them that, owing to "the great and growing importance to engineers of a knowledge of modern languages," it has been decided that after January 1, 1919, every candidate for election to associateship membership will be required to show by examination a suitable knowledge of one of the following languages—French, German, Hindustani, Italian, Russian, or Spanish. The educational system of this country, founded on early monastic teaching, has clung tenaciously to classical rather than modern languages, and this action of the council of the Institution of Civil Engineers may sound the knell of this fetish, and our educational system in schools and universities may now, it is to be hoped, make the necessary changes in their curriculum. It has often been claimed by the advocates of classical teaching that a knowledge of dead languages produces a more refined mind than that of a man or woman who has received no such teaching. But there is no proof of this, and having regard to the dreary waste of time attendant upon obtaining the merest smattering of such useless languages, we welcome cordially this glimmer of a more common-sense view of what is required in the struggle for existence. This circular may also be taken as a prophetic pronouncement with regard to the immense amount of engineering work which will be required after the war is over, not only in this country, but abroad, and it is evident that if an engineer is equipped with a thorough knowledge of the language of the country in which his work

s to be done, it would give him a considerable advantage over another engineer who had little or no knowledge of the language. This requirement of three months' residence will no doubt add to the difficulties of passing the already very stiff examinations now imposed on candidates for association membership, and will give them far more work to get through, unless they have been previously well grounded at school in one of the specified languages. It seems a pity that the world cannot have a universal language, say "Esperanto," which would so greatly simplify matters and prevent such an immense amount of time being used in the acquisition of foreign tongues. Possibly, in the course of the next hundred years or so this consummation may be reached, and we shall understand each other wherever we may be located.

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Some Questions for Surveyors.

A considerable part of the interesting paper which was read recently by Mr. A. Rothera, the surveyor and water engineer to the Spenborough Urban District Council, at a meeting of the North-Eastern District of the Institution of Municipal and County Engineers, was devoted to a consideration of certain provisions of the Public Health Acts Amendment Act, 1907. It will be remembered that, although the first part of this Act is of general application, the remaining sections have operation only in any district to which they may be applied by an Order of the Local Government Board, made on the application of the local authority. It is now ten years since the Act was passed, and although some of its provisions have no doubt proved useful, a large number of local authorities have been content not to use their power of adoption. Mr. Rothera instanced the question of the ownership of deposited plans as a matter in regard to which the provisions of the Act are distinctly useful. Apart from sec. 16, the law on this subject is none too clear, although there is a case on record in which a plaintiff unsuccessfully sued a local authority for the return of a disapproved plan. In those districts in which this section is in force, however, it is clear that the local authority may retain any plans, &c., deposited with *and approved* by them. It would perhaps have been better if the application of the section had been extended to plans that have been disapproved. Many other sections, indeed, are so drawn as to lead to the conclusion that some alterations might with advantage have been given to practical considerations in settling their phraseology. Take, for example, sec. 19, which deals with urgent repairs to private streets; no provision is made for doing such repairs to part only of a street, and in view of the fact that the Private Street Works Act, 1892, provides specifically for making up part of a street, the omission of the words in the later Act is probably not [illegible], although urgent repairs are doubtless generally required for part of a street rather than for a street as a whole. Mr. Rothera, in the course of his paper, commented on many other provisions of the Act, and also added one more to the many pleas that have been made for a codification of the vast mass of legislation with regard to public health law that is at present to be found in the statute book.

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Disposal of Trade Refuse.

A Local Government Board inquiry of more than usual interest was held by Mr. A. G. Drury, M.Inst.C.E., at Abingdon, last week, on an application of that borough to borrow money for the purchase of land in the parish of Sutton Wick for the purposes of sewage disposal. It transpired at the inquiry that in 1894 the boundaries of the borough were slightly extended, and that in the area added there existed a small tannery, employing only a few hands. In 1913 this tannery was acquired by a syndicate, and the works have grown to such an extent that the liquid trade waste from them has increased from about 50,000 gallons a day to more than 500,000 gallons a day. This huge quantity of liquid has not only overpowered the capacity of the sewers, but has also seriously interfered with the proper working of the corporation sewage farm, on which the ordinary sewage of the town—which has a population of about 7,000—has been successfully dealt with for the past forty years or more. Litigation was threatened, but eventually a provisional agreement was entered into with the syndicate that they shall pump their liquid trade waste direct from their works into settling tanks, which they will provide on land to be acquired, adjoining the existing farm. The effluent from the tanks would then be dealt with and further purified on the land thus acquired. There was some opposition to the application by an adjoining landowner, who had a large house and property which, it was alleged, would overlook the tanks, which necessarily would have to be placed at some height, owing to the land being of a very flat and level character. It was suggested during the inquiry that other land further removed from the objector's house could be obtained, and this question was left in abeyance for further settlement. It was evident at the inquiry that all parties were anxious to come to an agreement without undue friction, as the circumstances were entirely due to the war. The tannery has developed into a large manufactory of leather goods for military purposes, and this fact makes it a necessity that something should be done as quickly as possible, and without unduly hampering the works, or impeding in any way the output of their manufactured goods. It is rather a unique case, for whereas this trade waste will very shortly amount to at least 600,000 gallons a day, the dry-weather flow of ordinary sewage from a town of the population of Abingdon should not exceed 200,000 gallons a day; so that the liquid trade waste will be three times that of the domestic sewage. With the exception possibly of Burton-on-Trent, where the brewery waste liquid is enormous in proportion to the domestic sewage, we do not know of another town similarly situated in this respect to Abingdon.

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Llangollen Urban Councillors and the Medical Officer.

The county medical officer for Denbighshire, Dr. T. Roberts, is entitled to a measure of sympathy for the ill-mannered criticism to which he has been subjected by the members of the Llangollen Urban District Council. In pursuance of his official duties he forwarded to the council, in common with other local authorities, a communication asking for particulars of work done under the Housing Acts. The circular contained a number of queries to which replies were requested, with the object of obtaining accurate records with respect to the conditions of housing. The effect it had upon the council was, to say the least, unfortunate. One member, evidently viewing it as a piece of ill-timed iconoclasm, asked where people were to go if the council demolished houses, as there were no men available to put up new buildings. Another suggested that the medical officer might be doing better work for the county than by sending out long reports, adding that he (the officer) got a big salary, so he supposed he must write long letters to justify his existence. To make matters worse, the clerk of the council, according to the report in the *Liverpool Post*, expressed the opinion that they could very well do without the services of a county medical officer during the war, supplementing this with the pointed comment, "And he is of Army age." This frivolous and irresponsible way of dealing

with the county medical officer and his duties is, of course, utterly beside the mark. As regards the personal suggestion, it rebounds upon the heads of the critics, for Dr. Roberts, in a reply which he has sent to the *Liverpool Post*, shows that, although over military age, he had offered his services to the Army authorities. In addition to his ordinary duties, he is doing the work of two others in the public health service who have joined the Colours, while he has also voluntarily enrolled for the National Service. But, after all, the chief objection to the manner in which the medical officer's communication was discussed is that it is not business, which is, after all, the main thing that the members of a local authority should have in view.

* * *

A Question of Salary.

It is not often that the reason for the apportionment of salary between the offices of a surveyor and inspector of nuisances in the case of a joint appointment is stated as frankly as it was recently by a member of the Cleator Moor (Cumberland) Urban District Council. It appears that prior to December, 1915, when the offices were amalgamated, the salary of the surveyor was £170, but that upon the additional appointment as inspector being taken up, this was reduced to £120. It was recently decided to revert to the old plan of a separate inspector, but no provision was made for increasing the salary of the surveyor to the old figure. In these circumstances, we should have expected that an application for an "increase" to the former rate of £170 would have been granted as a matter of course. But no—the advocates of "economy" could not let the opportunity pass, one of them remarking that £120 a year was a long way above anything he himself had ever enjoyed. Another member observed that when the salary was fixed at £120, that sum was felt to be adequate for the post; to which another member replied with commendable candour that when the arrangement was made for combining the offices of surveyor and inspector of nuisances the salary of the surveyor was kept low and that of the inspector comparatively high because the council were able to recover half of the latter. Unfortunately, it is the admission which is unusual, and not the transaction. The system of combined appointments is open to many objections, not the least of which is this artificial belittling of the office of surveyor in order that a local authority may recover a trifling sum of money to which they have no moral right. We are glad to say that, as the result of a rather sorry discussion, the proposed "increase" was granted.

* * *

The Abatement of Nuisances.

The provisions of the Public Health Act, 1875, with regard to the service of notices for the abatement of nuisances are such as to leave it a matter of doubt in many cases upon whom the notice should be served. It will be remembered that sec. 94 of the Act provides for service "on the person by whose act, default, or sufferance the nuisance arises or continues; or, *if such person cannot be found*, on the owner or occupier of the premises on which the nuisance arises." In the case of the *Rhymney Iron Company, Limited*, v. *The Gelligaer Urban District Council*, which was recently decided by the High Court, an interesting question arose as to the meaning of the words which we have printed in italics. In that case the nuisance complained of arose in the drain of a house of which the company were owners, but not occupiers; and without examination it was impossible to say whether or not the nuisance arose from a structural defect. The company contended that, before a notice could properly be served on them as owners, the council were bound to examine the drain in order to satisfy themselves that the person causing the nuisance could not be found. It was argued for the council, however, that they were entitled to deal with the matter on the knowledge which they were able to gain on an ordinary inspection; and this view was upheld by the Court, who pointed out that the Act was designed for the protection of the public and the rapid suppression of nuisances; and that all that has to happen in order to enable the local authority to intervene, by serving a notice on the owner as such, is that it must be satisfied that there is a nuisance, and that in the then state of knowledge it has not been able to ascertain who is responsible without the exercise of powers of entry, search, opening up, &c.

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Cheap Tramway Fares.

In his report for last year, Mr. C. W. Mallins, A.I.E.E., the general manager, draws attention to the extremely cheap system of fares which are in vogue on the Liverpool Corporation tramways. In the industrial portions of Liverpool passengers are allowed to travel 3 miles 207 yds. for 1d. at all periods of the day, without restriction, which enables the workers to reside in the more healthy surroundings outside the industrial areas. This, as Mr. Mallins observes, is most essential in the interest and well being of the working population of a city like Liverpool, where—prior to the introduction of this cheap system of fares—very great congestion existed. Comparing the length which passengers are entitled to travel on the Liverpool system for 1d. with the average length which passengers are allowed to travel on seventy-two municipal tramway undertakings throughout the United Kingdom—viz., 1 mile 685 yds.—it will be at once apparent what the Liverpool Tramways Committee has done in the matter of providing cheap fares. It may be mentioned that many of the towns quoted grant concessions to working men for a limited number of hours during each day, but it would appear that, even with these concessions, the fares are not, in many cases, as cheap as those given to the whole community in Liverpool. The rates of pay granted to the employees, together with other liberal conditions, are about the best in the country, with the consequent result that labour troubles are unknown on the Liverpool system.

* * *

Enticing a Roadman.

At a recent meeting of the Haslemere Urban District Council a remarkable discussion took place on the action of the Vicar of Grayswood (who is also chairman of the Highways Committee of the council) in inducing one of the roadmen to leave the council's service and undertake work in his garden. To begin with, the report containing censure of this proceeding was signed by the offending Vicar himself, in his capacity as committee chairman. He did not, however, move its adoption; on the contrary, he made a spirited defence of his conduct. With the present shortage of labour, and the necessity of maintaining the roads in as high a state of efficiency as possible, it would be difficult to justify the transfer of a man from this work to work in a private garden. But it is only fair to say that, however indiscreet may have been the action of the Vicar of Grayswood, there were in his case at least some extenuating circumstances. We have seen a report of the discussion, and much of the language used appears to have been extravagant. We only refer to the matter here in order to commend the surveyor for the stand which he made against the chairman of his committee, whom he believed to have acted in a way which was contrary to the interests of the council, and to congratulate him on the all but unanimous indorsement by the council of his view of what must be regarded as an unfortunate transaction.

Coolgardie Water Supply, Western Australia.

By P. V. O'BRIEN, M.Inst.C.E., and J. PARR, B.Sc., Assoc.M.Inst.C.E.

[Abstract of paper read at a meeting of the Institution of Civil Engineers on the 4th inst.]

The construction of the Coolgardie waterworks was described by Mr. C. S. R. Palmer in a paper read before the Institution of Civil Engineers in 1905, and the object of the present paper is to review the works to date.

The water pumped at the first pumping station has increased from a little under one million gallons per day for the year 1903 to 3,300,000 gallons per day during the past two or three years. Of this quantity about one-fifth is accounted for in the agricultural areas traversed by the main, and four-fifths in the mining areas, but only three-fifths reaches Kalgoorlie. The total length of branch and reticulation mains now laid in the goldfields district is about 236 miles, and in the agricultural areas about 628 miles.

To minimise corrosion the water has been treated with lime since 1910, and additional tanks have been erected at several summits to keep the main full of water. Additional storage-tanks have also been provided at pumping-station No. 5, and at Kalgoorlie, and arrangements are now in hand to de-aërate the water before it enters the main.

THE RESERVOIR.

There has been at all times an ample supply of water available in the reservoir.

The principal substances in solution in the water are the chlorides of sodium and magnesium. The salinity increases each year from September to June, and falls more or less during July and August, according to the quantity of water flowing into the reservoir. A series of dry years naturally increases the salinity. The lowest salinity was recorded in October, 1905, viz., 4 parts of chloride per 100,000, equivalent to 4·6 grains of sodium chloride per gallon, and the highest in January, 1915, 30·2 parts chlorine per 100,000, or 35 grains of sodium chloride per gallon.

THE WEIR.

The wall generally is in good condition and the seepage through it is slight. Three boreholes sunk in the wall in 1914 showed a general slow infiltration of water through the wall and comparatively free flows at certain levels corresponding with horizontal lines of seepage on the down-stream face. Under such conditions the upward water-pressure in the wall must be taken into consideration in estimating the stability.

THE PIPE-LINE.

The lead joints have generally given good results, but in a few cases the frequent re-caulking of weak joints has caused rapid local internal corrosion and has rendered the removal of the pipes necessary.

The locking-bar joints have stood well, and only in one case has a bar failed.

In 1905 a leak occurred through external pitting, and since then there has been a gradual increase in the number of such holes each year. Wherever they occur the pipes are uncovered and supported on timbers clear of the earth. They are left open, and seem to keep generally in good condition at moderate cost.

The original bituminous mixture on the exterior of the pipes underground has practically all perished, but where the pipes are above ground it (and consequently also the pipes) shows very little deterioration. Where the pipes were laid underground in gravel or sand they show slight rusting only, but in heavy soil or clay country, which is generally salt, a considerable amount of pitting and scaling has been found.

The carrying capacity of the various sections of the main decreased for a number of years till it reached limits ranging from 33 per cent to 60 per cent below the original capacity. Since then it has remained practically constant. In consequence of the lime treatment of the water a deposit chiefly of carbonate of lime has taken place in the main, ranging in thickness from about ¼ in. at Mundaring to three-fifths at Kalgoorlie.

Nodules of rust have been found on almost every pipe examined, and without exception they are more numerous on the side of the pipe than on the other. The side carrying the most nodules is apparently the side which was the most exposed to the sun whilst the pipes lay on the ground before being laid, and has no connection with the present position of the pipe or the thickness of the bituminous coating. The nodules vary in number up to 90 per sq. ft. on the worst pipes. The height of the largest nodule on the pipes was found to be 1½ in.

The coating was found to have perished and to be porous to a depth of $\frac{1}{16}$ in., but beyond that it was in good order. The formation of the nodules appears to arise from cracks in the bituminous coating rather than from the gradual decay of the coating, for a close connection is apparent between the condition of the pipes and the severity of their exposure before being laid, whilst at the same time every pipe shows areas without nodules where the coating is thin and must have perished years ago.

Under every nodule there is a corresponding pit. As a general rule a few pittings up to ⅛ in. deep were found in the pipes wherever an inspection was made. In a few cases pipes were found practically free from pitting, whilst in a few others pittings over ⅛ in. and up to ¼ in. deep were found. Where the pittings were ¼ in. deep they were isolated, about ½ in. in diameter, and surrounded with metal of the full thickness and carrying mill-scale.

CORROSION.

Pitting starts wherever the water gets access to the steel and an adjoining layer of scale—thereby constituting a galvanic battery—and the depth of the pit will depend on the time taken to separate the piece of scale from the plate and thus destroy the element. Large areas of mill-scale and punctures in a thick bituminous coating are conditions highly favourable to deep pitting. The corrosive quality of the water appears to be due chiefly to its dissolved oxygen and carbon dioxide. The variations in the quantities of the salts found in the water make no appreciable difference in the corrosive quality. As the water passes along the main it loses over two-thirds of its dissolved oxygen and shows decreasing corrosive activity.

LIFE OF THE MAIN.

This will probably be determined either by leaks due to internal corrosion or by external corrosion close to the lead joints. The worst internally corroded pipe so far discovered shows a reduction in thickness along a strip 4 in. wide and the full length of the pipe, amounting to about 0·007 in. per annum. Such a pipe would probably have a further life of about ten years under similar conditions. By de-aërating the water, in addition to treating with lime, internal corrosion can probably be reduced.

The capacity of the main between pumping-station No. 4 and Kalgoorlie appears likely to meet all requirements for many years, but between stations Nos. 2 and 4 the quantity of water to be pumped is increasing every year, and it will probably be necessary in a few years to improve the capacities of these sections by overhauling some of the pipes or laying new ones.

THE PUMPING PLANTS.

On account of the increase in the friction in the main it has been necessary to reduce the sizes of the plungers at several of the pumping-stations, and the capacity of the pumps has been reduced accordingly from six million gallons per day to four millions.

The cost of pumping, including wages, salaries, fuel, oil, &c., repairs, renewals, alterations and maintenance of buildings and quarters is 0·27d. per 1,000 gallons lifted 100 ft.—equivalent to 0·57d. per effective or pump horse-power-hour. Taking the total quantity of fuel burned in the boilers for the past twelve months, the working duty of the plants is about 90 per cent of that guaranteed.

The whole of the pumping plants have kept in good order and have suffered only the usual wear and tear, requiring only minor repairs.

Institution of Civil Engineers.—The annual general meeting of corporate members, to receive the report of the council, and to elect the council and auditors for the ensuing year, will be held on Tuesday next, the 17th inst., at 5.30 p.m.

Dundee Housing Schemes.

SHORT-LENGTH TENEMENTS OF TWO, THREE, AND FOUR ROOMS.

An elaborate report on the housing of the working classes of Dundee has been presented to the Housing and Town Planning Committee of the corporation of that city by Mr. Jas. Thomson, the city engineer and city architect.

After detailing the preliminary arrangements essential in considering schemes of housing, Mr. Thomson says the sites which naturally suggest themselves at the outset as suitable for the purpose in Dundee adjoin the north, east and west margins of the industrial areas of the city. He submits plans which indicate by colour the extent to which the individual schemes would serve the residents of the immediately adjoining districts, these sites being styled "Stirling Park Scheme," "Springhill Scheme," and "Logie Scheme" respectively. A further plan shows the extent to which the schemes jointly would benefit practically the whole industrial central area of the city; and it is interesting to observe from this plan how small a section of the central industrial area is outside the portion in which it is proposed that the houses should be situated, and how reasonably distant every person engaged in work in the coloured area is within one at least of the housing sites. In each case the land proposed for the scheme is close to a centre of industry, and yet in an open and healthy locality; each has the advantage of being in close proximity to a tramway route; and each adjoins a public park—"Stirling Park Scheme" being within a short distance of the Law, "Springhill Scheme" having only Arbroath-road between it and Baxter Park, and "Logie Scheme" close up to Victoria Park and Balgay Hill. These amenities, Mr. Thomson points out, are in striking contrast with the conditions prevailing in the immediately adjoining districts, and offer exceptional opportunities for making a commencement with the solution of the housing problem, provided, of course, reasonable provisional agreements can be entered into for acquiring the land.

THE LAY-OUT.

In preparing these plans an important and, it is believed, a desirable departure has been made from the former system of lay-out in Dundee and other towns. Instead of continuous ranges of tenements fronting streets, with openings only at great distances apart, it is proposed that tenements should be in short lengths, with much larger open spaces in front, in rear, and at the ends of the blocks.

As far as the levels and nature of the land permit, all tenements are so set down that the sun will reach during a part of every day the windows of all habitable rooms. The erection of wash-houses and cellars, usual on the back space of tenements, has been entirely omitted, and the land kept free from outbuildings, boundary walls, and similar obstructions to the free flow of air and admission of sunlight.

Reasonable space has been provided for garden allotments, and areas reserved as playgrounds for children. Bowling greens conveniently near "Springhill" and "Logie" schemes are already provided respectively at Baxter Park and Victoria Park, and ground has been set aside in the "Stirling Park Scheme" to meet the demand at any time for a bowling green for that district.

A further important departure provides land on which wash-houses and baths may be erected for the use not only of those who will occupy the new houses, but for the convenience as well of other householders in the immediate neighbourhood. Moreover, keeping fully in view that the schemes are intended to accommodate, under the best possible conditions, those who occupy the smallest size of house, provision is made in each scheme for land on which a day nursery may be erected.

These last mentioned proposals relating to the provision of wash-houses, baths, and day nurseries, having regard to the large number of houses in each scheme, and having in view also how essential they are to the occupiers of small houses, should, it is suggested, be favourably considered, and should form part of any comprehensive lay-out, although financially kept separate.

TYPES AND SIZES OF HOUSES.

Mr. Thomson urges that if a forward step is to be made in the type of house to be provided for the working classes, and if the type adopted is to be one which will improve not only their housing conditions but their whole environment as well, then the prevailing method of erecting high barrack-like buildings with no open space in front except the public street and limited space in rear must come to an end.

If land can be acquired at a reasonable price, the buildings can justifiably be spread over a much larger area than formerly, and all reasonable means taken to provide the dwellers in the new tenements with facilities and surroundings as good as those provided for dwellers in cottages.

With these objects in view, it is recommended that in the entire area of each of the schemes the height of tenements should be limited to two storeys, with two exceptions in the "Stirling Park Scheme," where the surroundings and special circumstances justify three storeys. In point of fact, the new type of tenement should be a happy mean between the former barrack-like tenement and the modern cottage. "In tenements of this type," Mr. Thomson observes, "the size of houses now urgently required to make a commencement in solving the housing problem can be conveniently and suitably arranged; and houses of only three rooms and under would be provided. Calculated on the basis of erecting houses of three rooms, of two rooms, and of one room, each equipped with proper facilities and conveniences, the number should not exceed twenty to the acre, and this would compare with the existing practice of approximately eighty to the acre in tenement areas."

In designing houses of one room, of two rooms, and of three rooms, each containing thorough modern equipment, the aim has been to provide accommodation suitable for the requirements of those employed in the immediately adjoining industrial areas.

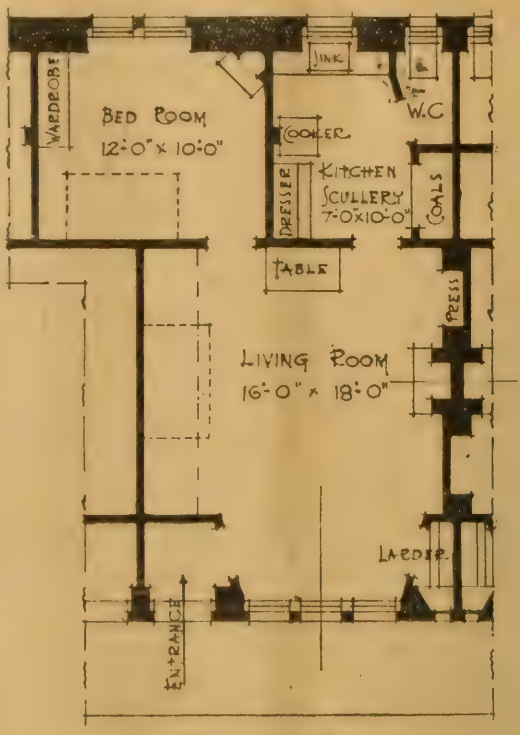
Sketch plans have been prepared of a house which should adequately meet the requirements of (*a*) a single woman or two single women, or a widow with no family; (*b*) of a married couple with a small family; and (*c*) of a married couple with a large family; and in the preparation of these plans the opportunity has been taken of showing how persons of the working classes who are sufficiently aspiring may be enabled, as they are clearly entitled, to raise themselves from their present insanitary and sordid surroundings to dwellings which provide nothing more than the just due of human beings.

The accompanying plans contain three preliminary suggestions marked type A, type B, and type C, which indicate the minimum of accommodation reasonably required in houses of the working classes. It is specially emphasised that each should contain a living room of ample size, well lighted and ventilated, and with larder in direct communication with the outer air; a kitchen-scullery with gas cooker, dresser, sink, and coal bunker, with press over for utensils; and an inside water-closet entering off the kitchen-scullery.

Mr. Thomson insists that there should be no ash-pits, and a special system of ash-bins would be provided for the removal of house refuse. Neither is there any provision for separate wash-houses on the back ground nor for baths within the dwelling-houses, a central building containing wash-houses and baths being suggested for each scheme of housing; and from this central building it is recommended, having regard to the ample steam power therein, that a system of hot water supply and heating should be installed and laid on, subject to control and restriction, to each dwelling-house. "In this connection," says the city engineer, "there can be no doubt such an installation would tend to economy in fuel, convenience to occupiers, and improved sanitary conditions in dispensing with smoke from numerous chimneys.

"These recommendations may be deemed revolutionary: but, in view of the immense benefits which are bound to result from their adoption, they should be given a fair trial, more especially when it is remembered that the selection of tenants and the management of the property will be in the hands of an efficient caretaker resident within each housing area. The appointment of resident caretakers will be essential in any event, the number of houses being

TYPE A



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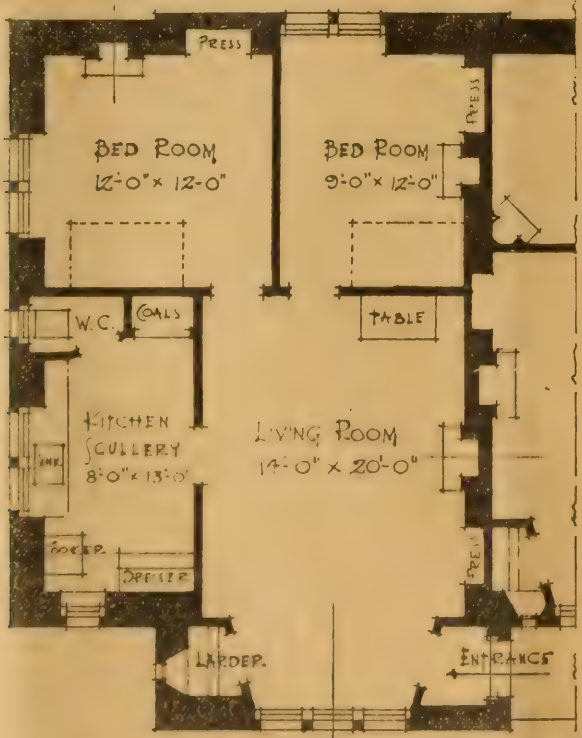

TYPE C

Jas. Thomson, City Architect.

Dundee Housing Schemes Suggested Types of Dwellings.

172 in the 'Stirling Park Scheme,' 479 in the 'Springhill Scheme,' and 314 in the 'Logie Scheme.'"

ESTIMATES OF COST.

The report recommends that an effort should be made to obtain land at such a price that the annual charge upon each tenement will be not much in excess of 10s. per annum. On this assumption, and on the basis of twenty houses to the acre, the price payable at twenty years' purchase should be not more than £200 per acre.

In the preparation of the statement applicable to buildings (*a*) interest is calculated at 5 per cent per annum; (*b*) the loan period is taken at sixty years; (*c*) the system of repayment is by equal annual instalments of interest and principal combined, amounting together to £5 5s. 8d. per cent; (*d*) the cost is taken at probable post-war rates, standardisation of parts, simplicity in design, and economy in construction being aimed at; (*e*) a grant in aid by the State is assumed at 25 per cent of the cost of buildings only; (*f*) no property tax is chargeable; and (*g*) the rent payable for each house includes occupiers' rates, garden allotment if desired, certain house furnishings, and 6d. per week for the use of baths and wash-houses and for supply of hot water to kitchen-scullery and radiator to living room.

STIRLING PARK SCHEME.

Expenditure.

Cost of buildings ... £58,000			
Less proposed grant in aid 14,500			
£13,500 at £5 5s. 8d. per cent	£2,298	0	0
Owners' and occupiers' rates, £2,453, at 6s. 9d. per £	828	0	0
Repairs, management, &c., on nett rental, £2,453, at 10 per cent	245	0	0
Fire insurance, £40,000, at 1s. 6d. per cent ...	30	0	0
Payment to baths and wash-houses department, 172 houses at 6d. per week	224	0	0
Total expenditure	£3,625	0	0

Revenue.

6 houses of living room and kitchen scullery at 6s. 6d. per week	£101	8	0
124 houses of living room, 1 bedroom, and kitchen scullery at 8s. per week	2,579	4	0
42 houses of living room, 2 bedrooms, and kitchen scullery at 9s. 6d. per week... ...	1,037	8	0
Total revenue	£3,718	0	0

SPRINGHILL SCHEME

Expenditure.

Cost of buildings ... £168,000			
Less proposed grant in aid 42,000			
£126,000 at £5 5s. 8d. per cent... ...	£6,657	0	0
Owners' and occupiers' rates, £6,765 at 6s. 9d. per £	2,283	0	0
Repairs, management, &c., on nett rental, £6,765 at 10 per cent	676	0	0
Fire insurance, £120,000 at 1s. 6d. per cent...	90	0	0
Payment to baths and wash-houses department, 479 houses at 6d. per week	623	0	0
Total expenditure	£10,329	0	0

Revenue.

20 houses of living room and kitchen scullery at 6s. 6d. per week	338	0	0
362 houses of living room, 1 bedroom, and kitchen scullery at 8s. per week	7,529	12	0
97 houses of living room, 2 bedrooms, and kitchen scullery at 9s. 6d. per week... ...	2,395	18	0
Total revenue	£10,263	10	0

LOGIE SCHEME.

Expenditure.

Cost of buildings ... £110,000			
Less proposed grant in aid 27,500			
£82,500 at £5 5s. 8d. per cent	£4,359	0	0
Owners' and occupiers' rates, £4,466 at 6s. 9d. per £	£1,507	0	0
Repairs, management, &c., on nett rental, £4,466 at 10 per cent	446	0	0
Fire insurance, £80,000, at 1s. 6d. per cent ...	60	0	0
Payment to baths and wash-houses department, 314 houses at 6d. per week	408	0	0
Total expenditure	£6,780	0	0

Revenue.

12 houses of living room and kitchen scullery at 6s. 6d. per week	£202	16	0
228 houses of living room, 1 bedroom, and kitchen scullery at 8s. per week	4,742	8	0
74 houses of living room, 2 bedrooms, and kitchen scullery at 9s. 6d. per week	1,827	16	0
Total revenue	£6,773	0	0

Abstract.

Cost of buildings, less grant in aid—3 schemes, 965 houses	£252,000	0	0
Estimated annual expenditure—3 schemes, 965 houses	20,734,	0	0
Estimated annual revenue—3 schemes, 965 houses	20,754	0	0

In explanation of these figures it is pointed out that the rents of houses have been fixed at such rates per week as will enable revenue to meet expenditure.

It is also explained that if the price of land and the cost of streets be charged to the housing account instead of to the public health and roads and streets accounts, the rent of each house per week will be increased by about 6d. in Stirling Park, by about 1s. in Springhill, and by about 6d. in Logie scheme; and further, that if the Government grant be one-third instead of one-fourth of the capital cost of buildings, the rent of each house will be decreased by about 6d. per week in all the schemes.

In a concluding note Mr. Thomson points out that there has been a diminution in Dundee of 433 houses of the smallest kind in five years, notwithstanding that the population has increased by 7,000 persons. To this there must yet be added 605 houses to be demolished under the Central Improvement Scheme, bringing the figure up to 1,038 houses. Even this large figure, however, does not correctly represent the number required, because provision must be made for men returning from military service who have been recently married and others likely to be married, and further provision must also be made against the large number of insanitary dwellings which will yet be closed. In short, the supply is decreasing while the demand is increasing.

Having regard to these facts, Mr. Thomson thinks it will be apparent that the provision of 965 houses included in the three schemes would be a moderate though valuable instalment towards the solution of the problem; and the circumstances narrated would appear fully to justify favourable consideration of the present proposals, and even further proposals, provided always liberal State aid can be relied on.

This leads the city engineer to the consideration of another method of improving the housing conditions of the poorest.

There has been a tendency on the part of artisans and others to leave tenement dwellings and to occupy or own cottage dwellings, and, given the possibility of obtaining cheap land in the suburbs near tramway routes, he considers this tendency is likely to extend. Inquiries have been made regarding suitable land, and he thinks it is highly probable that, if the town council were to authorise provisional negotiations, substantial progress could be made and schemes drafted whereby such land could be acquired with much advantage, and without loss, to the ratepayers. The town council could acquire land in large blocks at a much lower price than the rate expected from individual feuars, and justification for their action would lie in the fact that they would enable the poorer class, by the well-understood process, to move upward to the better houses vacated by those leaving better-class tenements, and thus make an appreciable contribution to the supply of good houses.

Mr. Thomson insists that if the town council hope to face the question with any degree of success the work must not be done in small sections scattered promiscuously over existing congested or insanitary areas. It would be wrong to house the people among their present surroundings. Ample areas of unbuilt-on land situated conveniently near the work of the people may be obtained, and on these areas the houses should be erected on a large scale, and let under a strict system of selection and supervision, where a higher standard of living could be encouraged by the town council and enjoyed by industrious members of the community.

Municipal Pig-Keeping. Grimsby Corporation have received a windfall in the shape of a premium of £1,000 from Mr. Wm. L. Black for the establishment of a municipal piggery.

REINFORCED CONCRETE BRIDGES WITH THROUGH ARCHES.

Two reinforced-concrete arch bridges built recently in Illinois are of the Marsh "rainbow-arch" type—the invention of Mr. J. B. Marsh, of Des Moines, Iowa—having through spans in which the deck is above the level of the spring line, while its middle portion is suspended from the arches.

The special feature of this type of concrete bridge is that it permits longitudinal expansion and contraction movements of the deck without affecting the arches. This is provided for by making the deck slab independent of the arch ribs at the two points where its plane intersects them, and supporting it at each of these points upon a cross-girder or floor-beam built integrally with the arches. The floor slab is practically monolithic, but has a chance to deflect between the floor beams, as there is a construction joint over the centre of each beam, and the reinforcing in the top of the slab does not extend over the beams, although the lower reinforcing is continuous.

The design is considered to be economical, and is (it is pointed out by the writer of an article in *Engineering News*) of particular advantage where the headway is insufficient for a deck-arch bridge or where the flood line approaches to the level of the bridge floor.

One of the two bridges referred to above has five spans with a clear distance of 80 ft. between piers. It carries a roadway 18 ft. wide. The arches are segmental, with a rise of 16 ft. and a radius of 58 ft. on the lower side. Each rib is 22 in. wide, with a depth of 26 in. at the crown and 35 in. at the floor intersection. They are spaced 18 ft. apart in the clear. The steel reinforcement in each arch is a box-lattice girder composed of four flange angles, with lacing bars on all four sides. To this girder are attached the hangers (composed of four angles), the lower ends of which are connected by pairs of transverse angles embedded in the floor beams. At the ends the arch thrust is taken by the side walls of the hollow abutments, but at the piers the steel ribs of adjacent spans are connected, so as to form a continuous structure.

The end floor beams are built into the arch ribs, and are integral with them. The deck of each span is a 7-in. slab, built integrally with the intermediate floor-beams (carried by the hangers) but independently of the end floor beams and abutments (or piers). Thus the slab can move horizontally without any effect upon the movements of the ribs. Each pier consists of a pair of pedestals connected by a curtain wall. The abutments are of hollow box form, with transverse struts.

The method of construction of the rainbow-arch bridges is to place the structural steel reinforcing of the ribs first and connect them rigidly in place with struts, floor-beams, and hangers. The formwork is then built around the steel reinforcing. The reinforcing for the arched ribs is composed of four angles laced on four sides, and with the back of the angles placed outward, which gives the maximum value for the metal. The angles can be made heavy enough to carry the forms, and the formwork of the bridge, including the weight of the concrete.

"Rainbow-Arch" Reinforced Concrete Bridge.

WAR-TIME EFFICIENCY AT HARROW.

COUNCIL CHAIRMAN'S TRIBUTE TO SURVEYOR.

In his review of the activities during the past year of the body over which he presides, Mr. Charles, the chairman of the Harrow Urban District Council, paid a striking tribute to the work of the surveyor, Mr. J. P. Bennetts. He pointed out that, although Mr. Bennetts had been almost entirely depleted of his staff, the regular administrative work of the town had been proceeding practically on the lines of pre-war days. It was a great accomplishment, and could not have been done without much hard work and strain in every direction. He could not help feeling that the public of Harrow, whom they represented, felt grateful to them, though they did not always show it, that they, through their officials, had been able to conduct the affairs of the town so successfully, and had been able to keep up the high standard of efficiency in the way they had done. Even the house collection of refuse had been carried out as formerly, though they were now bound to arrange a fortnightly collection.

LAND CULTIVATION.

But the most important work they had undertaken, he thought, was that of land cultivation. They anticipated the Board of Agriculture's scheme, and had the land in preparation actually before they received the Board of Agriculture's consent to go on with it. The number of new allotments had now grown to 400. They had looked well ahead to see where seed potatoes were to come from. They endeavoured to make arrangements with the War Agricultural Committee, and through them with the Board of Agriculture, but they did not feel safe in depending on either of them. They therefore took the bull by the horns, and they decided to purchase their own seed; and they had been highly successful, because up to the present they had delivered twenty-eight tons, embracing 1,300 lots, the price on delivery being 14s. 6d. per cwt. That, he thought, was a big accomplishment, and it was only those who had been in close touch with the surveyor who knew the enormous amount of work entailed. There were members of the council who knew, and he was speaking with every authority when he said that the way Mr. Bennetts had carried through that allotment question, and more particularly the very heavy task of purchase and distribution, did him the greatest credit. He felt that he was only expressing their sentiments, and through them the thanks of the people of the district, in giving unbounded praise to Mr. Bennetts for the able and excellent way in which he had carried through all those things.

Coast Sand Dunes. (By Gerald O. Case, St. Bride's Press, Limited, 24, Bride-lane, E.C. 4, price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

A SURVEYOR'S SALARY.

THE LOCAL GOVERNMENT BOARD CONTRIBUTION AGAIN.

At their last meeting the Cleator Moor, Cumberland, Urban District Council had before them an application from their surveyor, Mr. R. Robertson, for an increase of salary. Mr. Robertson pointed out that previous to his undertaking the duties of sanitary inspector his salary was £170 per annum, but since December, 1915, he had been receiving £120 as their surveyor.

The chairman moved that a committee consider the question of the surveyor's salary, comparing information about the salaries of officials in a similar position in other districts, and report to the council.

Mr. Gowan moved as an amendment that the surveyor's salary be increased to £170, as it was before. He thought it was only right and fair to give him what he had previously. Some of the workmen had more than the surveyor had, and he thought it was a crying shame to put a surveyor on a salary of £120 a year. He would not like to say it was a plot, because these things had to be proved; but he thought it was a little bit of meanness.

Mr. Sloan seconded the amendment. He did so on the point of justice. When they separated the offices of surveyor and inspector he understood that that would not injure the surveyor, but that he would go back to the salary he had before he took on the duties of inspector also. He was afterwards surprised to find that as surveyor, with the joint office, Mr. Robertson had only £120. Mr. Gowan thought it was spite. He did not think that. He thought it was just a mistake. Mr. Robertson started at £100 or £120, and his salary was increased to £170 before the combination of the two offices of surveyor and inspector; and now that they appointed a separate inspector Mr. Robertson's salary ought to go back to £170.

The chairman said a committee could go into the whole matter. There were some questions that could be inquired into. Mr. Robertson, at the time of the combination of the offices, was quite willing to take £120 as surveyor. The feeling of members at the time was that £120 was plenty; and the combination of offices was made so that he would not suffer loss. But Mr. Robertson did not do the work of the inspector, and therefore the salary that he did not do the work for was taken from him. With places like Millom paying their surveyor £100 a year, and Egremont £90, he did not know that Cleator Moor was so far behind. Let the matter go to committee, and let the committee report, and then they could move what advances they liked.

Mr. Walker said he was present when the arrangement was made for combining the offices of the surveyor and inspector, and he did not think the members considered £120 was sufficient for the office of surveyor, and the member who brought the proposal up did so because he thought £120 was plenty; but the salary for the surveyor was kept low and that of the inspector comparatively high because the Local Government Board paid half of the salary of the inspector, but did not pay any of the salary of the surveyor. Perhaps in saying that he was saying too much; but this was the reason why the salary of the surveyor, when the offices were combined, was reduced to £120.

Mr. Gavan Duffy said there was no getting over the fact that since the outbreak of war the cost of living had gone up, and he could not preach that outside and oppose an increase to the surveyor. He therefore supported the amendment.

Mr. Cullen thought £120 was too little.

Mr. McLauchlan thought the most reasonable way for a committee to go into the question from the beginning and report to the council. The members selected for the committee would very likely do what was fair and honest between man and man; and if they went into details they would know the why and wherefore, which would have effect on members of the board. One hundred and twenty pounds a year was a long way above anything he (the speaker) ever had. (Laughter.) Wages should be cut according to the work there was done for them, and he thought, taking into consideration the work done, £120 was quite sufficient. He therefore supported the motion.

The question was put and the amendment (the *Whitehaven News* states) was carried by a decided majority.

STEAM WAGONS.

THE "SENTINEL" HYDRAULIC END-TIPPING MODEL.

Salford Corporation Gas Committee have placed an order with Messrs. Alley and MacLellan, Ltd., Shrewsbury, for a "Sentinel" steam wagon of the type illustrated herewith.

3½-Ton End-Tipping "Sentinel" Steam Wagon.

The machine in question is the firm's standard 3½-ton hydraulic end-tipping model, and is fitted with an end-tipping body operated hydraulically by means of a small steam pump feeding pressure water into the hydraulic cylinder, which is placed underneath the wagon body, and raises the body to the discharge angle by means of a ram, the hydraulic cylinder oscillating in top trunnions to allow this. The remainder of the chassis is of the well-known "Sentinel" design, with small water-tube boiler supplying steam to a double high-pressure twin-cylinder engine placed underneath the frame of the vehicle, the engine in turn being permanently and directly geared to the rear axle by means of a "Renold" roller chain. The driver, seated in a comfortable cab, has an entirely clear, unobstructed view of the road and all traffic ahead and around, and is not distracted by revolving machinery in front of him, or the need for lubricating the engine while at work, since this and other working parts are enclosed in oil baths.

The vehicle illustrated is powerful enough to carry its full nett load of 3½ tons up a gradient of one in eight, and its legal speed is twelve miles an hour, which is easily maintained as an average on ordinary give-and-take roads.

Messrs. Alley and MacLellan have already supplied large numbers of these wagons to the principal corporations, and their output is at the present time booked for a long way ahead.

A New Housing Scheme.—Lord Rhondda, President of the Local Government Board, is reported to be preparing a new scheme for the better housing accommodation of the wage-earning classes.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not rather a new departure of the council of the Institution of Civil Engineers to have made it compulsory that candidates for their examinations must show a knowledge of one of the following modern languages—French, German, Hindustani, Italian, Russian, or Spanish? But why is German left in, and Irish left out? Is there a sign of the "Hidden Hand" in this?

* * * *

Can one be surprised that the county councillors are in two minds as to paying their own expenses when attending the meetings of that body? Does it not seem to be rather an anomaly that whereas Members of Parliament have voted themselves £400 a year each for their national services, county councillors, and, indeed, everyone who is engaged in public work, should have to pay their out-of-pocket expenses? But what about surveyors who have to pay their own expenses when attending meetings in order to gain knowledge for the benefit of their employers?

* * * *

Are not the recent articles by Mr. Reginald Brown, M.Inst.C.E., in The Surveyor on the "Cultivation of Lands Order, 1916," well worth a careful study by all surveyors who are engaged in assisting in carrying out the work involved by this Order? Has not Mr. Brown set an excellent example to other surveyors and engineers by giving us the benefit of his experience, and would it not help us all in our profession if others would give us their experiences in engineering and other matters? When there are no text-books on a subject, is not this the only way in which we can learn?

* * * *

Is it not a "bit of a score" for bituminous carpeting that the length of Park-lane, which was laid with this material about two years ago, is standing up so well against the fast motor omnibus, as well as other traffic, to which it is subjected? Were there not some doubts expressed at the time it was laid as to whether it was a suitable material for the surface of a road carrying such traffic?

* * * *

Could the example of the Pennsylvania Highways Department of exhibiting a model showing three types of badly-located roads, and how they should be re-located satisfactorily, be followed in this country when times are normal again? Is not the account of the model, which is only 6 ft. by 5 ft., in a recent issue of *The Engineering Record* very interesting as showing what can be reproduced, in relief to proper scale, on a model of these modest dimensions?

* * * *

Was it not rather staggering to hear from Captain Bathurst in the House the other night, in answer to a question, that the number of licensed dogs in the United Kingdom is 2,500,000? Might we not add at least another 500,000 unlicensed dogs, making a total of at least 3,000,000 dogs who must consume at least 150,000 tons of food a year, of which a large percentage is no doubt fit for human consumption? When we further consider the condition of our finances in cities and towns, is it not somewhat amusing that the selfish luxury of keeping a useless animal should still be allowed?

* * * *

How can the Corporation of Birmingham committed [illegible] after the war [illegible] At a recent meeting it decided, on reports from various committees, to spend the following sums, amounting altogether to £1,597,434: [illegible] £616,000, [illegible] £180,434, [illegible] £711,000. Where is all the money which will be required necessary and all the works contemplated by the various local authorities after the war to come from?

* * * *

It is rather interesting to find that there is a legal difficulty involved in the attempt to alter the present practice of "Keep to the right" by police regulation, as "it appears that it is part of the law of the road, and one can hardly be carried by by-law"? If this is so, and if [illegible] is correct, it will not be possible to carry out the [illegible] which [illegible] Parliament. Do we not [illegible] "must keep to the left" should be stuck up at the [illegible] of the country?

WATER SUPPLY IN THE INTERIOR OF WESTERN AUSTRALIA.

By P. V. O'Brien, M.Inst.C.E.

[Abstract of paper read at a meeting of the Institution of Civil Engineers on the 4th inst.]

Physiographically West Australia is divided into three districts—namely, the Coastal Plain, the Coastal Ranges, and the Plateau of the Interior—and, geographically into six divisions, the aggregate area of which is 976,000 square miles. Temperatures vary with the distance from the coast, with latitude to some extent, and also with the prevailing winds. Generally the inland plateau is intensely hot in summer and cool in winter. The atmosphere is dry, the evaporation great, and the rainfall very low.

Rivers in the north-west of the State carry water only after heavy tropical rains, and then for a short period only. With the exception of the extreme south-west division no perennial streams or fresh-water lakes exist.

Scattered over the interior are numerous salt lakes, ranging in area from a few acres to 1,000 square miles. There is little doubt that these chains of salt lakes were at one time flowing rivers, but have altered owing to the rising of the land and the change of climate.

The mineral belts, chiefly auriferous, stretch from the south coast, with a few breaks, to the northern or Kimberley Division. A great many mineral finds were made in the early 'nineties, and a large influx of population occurred. Many finds have also been made since the great gold rush, and there is little doubt that many more will be made in the future.

The rush of population mentioned above resulted in hundreds of mining camps springing up, many of which grew rapidly into prosperous towns. These, with the scores of smaller townships, are supplied with fresh water, and ore treatment plants on mines are supplied with salt or fresh water, or both. Roads, railways, and stock routes followed settlement, and water supplies were generally kept ahead of settlement.

Artesian basins exist, but do not extend to the interior. Therefore other sources of supply were looked for and found in subterranean water at depths varying up to 200 ft., and in conservation of rain-water.

Over the greater part of the Central Division the ground water is salt. During the first few years of the gold rush this water, being the only kind procurable, was distilled and sold at 4d. per gallon. No distillation has been necessary since 1900.

SALT-WATER WELLS.

Salt water is used in ore crushing and for other purposes on mines. Heavy flows cannot always be found just where required, and in such cases it has been necessary to pump from various distances up to 18 miles from the source of supply to the mines.

FRESH-WATER WELLS.

North of south latitude 29 deg. fresh subterranean water may generally be found. Hand percussion boring plants are used to find water, whether fresh or salt. Boring costs 5s. to 6s. per foot, including transport charges, and men's time travelling.

Wells are sunk along roads and stock routes, and provided with windmill equipment, when they supply small town sites.

In areas where fresh subterranean water is found, towns and mines are supplied from groups of wells by pumping. The towns are reticulated and the house services are metered.

Charges for water range from 3s. to 7s. 6d. per 1,000 gallons for salt water, and 4s. to 7s. 6d. for fresh water.

CATCHMENT AREAS.

Over the Central, and part of the Eucla Division, from about south latitude 29 deg. to the Southern Ocean, the subterranean water is salt. Fresh water is obtained by conservation of rain water.

Distributed over the granitic portions of these divisions are large granite outcrops, ranging in area up to 300 acres, and in altitude to 150 ft. above the surrounding plain. These rocks form excellent catchments for tanks. Masonry in cement drains are built round the rocks, and the run-off intercepted by these drains is led by carrier races to the reservoirs. Of the first inch of rain falling on rock catchments 95 per cent has been impounded, and from rains following 100 per cent.

Catchments other than rock generally consist of

The Surveyor
And Municipal and County Engineer.

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gently sloping country, with surface of clayey loam, granite sand, with stony patches, &c., the whole more or less covered with timber and scrub. The natural vegetation on catchments is preserved, as its destruction would result in the discharged water becoming salt.

The yield of each rainfall depends on the intensity of the fall on each acre of catchment, the duration of the fall, the length of dry period before the rain, and whether it falls during the hot or the cool season.

The yield from a catchment-area may be greatly increased by making a network of furrows, or small drains, to lead the water quickly into the main channels. Money is well spent on such work.

RESERVOIRS.

Reservoirs, known locally as tanks and dams, are divided into six classes:—

(*a*) Excavated tanks in watertight ground;
(*b*) Tanks made to hold water above the natural surface of the ground;
(*c*) Excavated tanks, clay-pug lined;
(*d*) Concrete-lined excavated tanks;
(*e*) Asphalt-lined tanks;
(*f*) Iron tanks with artificial catchments.

The method of construction of these various tanks is described in detail in the Paper and illustrated by examples.

In building reservoirs or tanks in a dry climate an allowance should be made for evaporation in reckoning the capacity, or evaporation should be prevented. It has been proved in the central division that roofing pays better than adding to the capacity. Tables attached to the Paper show the evaporation outside the reservoir at Menzies during 1910 to have been 151·93 in., and the loss by evaporation from the covered tank as 2½ in. The water saved paid for the roof in a short period.

WATER SUPPLIES OF PRINCIPAL TOWNS.

The Paper concludes with descriptions of the water-supplies in five of the principal towns in the Interior. The capital costs range from £22,000 to £53,000.

Generally these works provide salt water from wells and fresh water (conserved) for mines and towns. In most cases the two kinds of water are pumped through the same pipes, and in other cases three waters are similarly delivered. The power used is from either gas or Diesel engines, the fuel in the former case being producer-gas made from charcoal and latterly from wood.

CORRESPONDENCE.

Εις ἀνηρ οὐ πάνθ' ὁρᾶ
(One man does not see everything.)
—Euripides.

FOR THE MEN ON SERVICE.

To the Editor of The Surveyor.

Sir,—I have received a letter from a writer who is personally unknown in which he says:—

"Since my departure from home on active military service, some time ago, I am denied the pleasure of reading the current issues of the trade journals. I am not grumbling, but as I seem to be losing all trace of current events, my mind travels back, and I remember your offer in trade papers some time back to send to readers certain books, periodicals, &c., which you had read and finished with. Hence my letter to you. Perhaps you cannot imagine what it is like to be away from trade news for months. It is miserable! There are many others like myself who would be pleased to have trade papers sent regularly to them. It would give them something to look forward to and something to think about besides this terrible war."

I am sure there are many papers being sent out by those who have relatives in the Army and Navy. There are also many surveyors' assistants, as well as apprentices, and men from shops, works, and offices who have no papers sent to them who would be pleased to receive the papers. Hence my reason for sending you this letter.

I hope that some of the lucky ones who are left at home will take the hint and send any papers to those who are fighting for us.—Yours, &c.,

J. H. Kerner-Greenwood.

King's Lynn.
April 5, 1917.

[We are sure that Mr. Kerner-Greenwood's appeal will not be allowed to go unheeded. As regards periodical literature, however, we would point out that, as a rule, professional journals are carefully preserved for future reference, and this being so a present of a subscription would seem to be the only certain means of ensuring anything like an adequate number of papers being sent.—Ed. Surveyor.]

REFUSE DESTRUCTOR CLINKER IN ROAD MAKING.

To the Editor of The Surveyor.

Sir,—I used the above material mixed with tar, &c., for surfacing carriageways in August, 1905, so that it can hardly be called a *recent* experiment, as mentioned in the excellent paper by Mr. J. G. Carey at the Eastern District meeting of the Institution of Municipal and County Engineers, on Saturday, March 31st.

I shall be glad to know if there is any record of the material having been used for this purpose prior to 1905.—Yours, &c.,

Frank Roberts,
Borough Surveyor, Worthing.

April 7, 1917.

NORFOLK COUNTY SURVEYORSHIP.

MR. W. W. GLADWELL'S APPOINTMENT MADE PERMANENT.

At the meeting on Saturday of the Norfolk County Council, Mr. Bussell Colman, chairman of the Eastern Highways Committee, submitted a recommendation that Mr. W. W. Gladwell's appointment as county surveyor be made permanent. Mr. Gladwell, he said, had won the very high opinion of the committee by the way he had carried out the very onerous duties he had been called upon to perform since the death of Mr. Heslop. It was an additional pleasure to know that Mr. Gladwell had been promoted from a lower to a higher rank, a thing the committee were most anxious to do whenever possible.

Mr. Hamon le Strange, in seconding the motion, said the Western Highways Committee entirely approved of the appointment, and were glad that it had been possible to give promotion to one of their officials.

Mr. W. B. Taylor expressed his appreciation of the policy of giving clerical an opportunity of rising to higher positions.

The report was agreed unanimously.

Sewage Disposal.

ACTIVATED SLUDGE *v.* TANKS AND FILTERS.

The activated sludge process during the past two years has taken a prominent place among methods of treating sewage, and there have been many investigations to ascertain its capabilities. The primary function of this process is the oxidation of organic matter brought by the agency of bacteria living in the presence of an ample supply of oxygen. As this is the primary function of the trickling filter also, it is important to know which is the more advantageous process. This can only be determined by a comparison of the respective costs of the two processes and an analysis of their individual advantages and disadvantages. In making such studies the local conditions in each case must be given their merited weight. In the comparison discussed in this paper by Mr. Harrison P. Eddy, before the Western Society of Engineers, and published in their Journal, the problem has been applied to the conditions existing at Fitchburg, Mass., a city of 40,000 population, where an Imhoff tank-trickling filter plant has been in successful operation since October, 1914.

TWO COMPARABLE PLANTS.

The following discussion of construction and operation costs is based on studies of two treatment plants, one for the Imhoff tank-trickling filter process, and the other for the activated sludge process, both plants

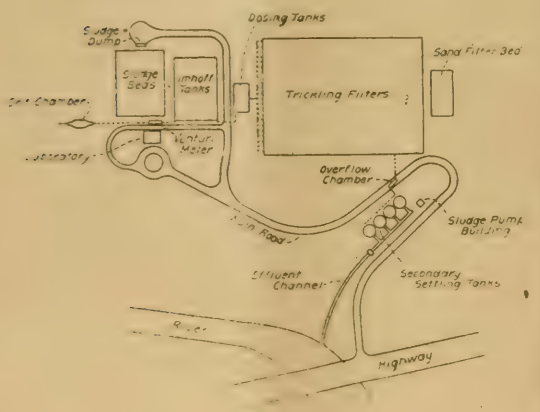

Fig. 1.

being designed to satisfy the same conditions. The trickling filter plant has been based on the design and cost of the plant at Fitchburg, Mass., with such modifications as are necessary to reduce the costs to units suitable for comparison. The activated sludge plant has been designed to meet the same conditions, and where possible the same unit costs of construction have been employed. The design has been based upon experience gained from several experimental plants operated by the author during the past year, and on data procured from Milwaukee and other cities.

Both plants have been designed to care for the sewage from a population of 55,000 persons. The average quantity of sewage is assumed to be 100 gallons per capita per day, equivalent to 5,500,000 gallons per twenty-four hours, and the detention tanks in Imhoff and Dortmund tanks has been based upon a flow of 125 per cent of this average.

Fig. 1 shows the arrangement of the Imhoff tank-trickling filter plant, the design being based on that at Fitchburg, the only material modification being to increase the size of the trickling filters and dosing tanks to provide for a population of 55,000 instead of 40,000 persons. The foundation of the plant was built to carry a population of 75,000.

The plant for the activated sludge process, shown in Fig. 2, has been designed as far as possible to meet the same conditions as those for which the trickling filter plant was built. The same type of construction has been used where applicable, and an effort has been made in every way to make the two plants strictly comparable, both being designed to serve 55,000 persons.

COST OF CONSTRUCTION.

The cost of the trickling filter plant, as already stated, has been based on the unit costs of construction of the trickling filter plant at Fitchburg, Mass., which was built by contract, bids being received in May, 1913. Cost figures obtained in this way are more nearly representative of normal conditions than if based on the high cost of construction prevailing at the present time. As far as possible the same unit of costs of construction have been applied to the estimates of the activated sludge plant, that the two estimates may be comparable.

Trickling Filter Plant.—The estimated cost of the trickling filter plant is given in Table 1. In addition to the main features, a number of items are included which go to make up the complete plant. It should be noted that the amount included for cost of land includes not only the land required for the treatment plant, but a total area of about 117 acres, sufficient not only for all purposes of sewage treatment, but also more than sufficient to properly isolate the plant. Under miscellaneous work are included such items as extension of the water supply, electric lighting system, and other features of minor importance not covered by the principal items. It is expected that for a plant of this character administration charges may easily amount to 3 per cent, and engineering to 12 per cent, making a total of 15 per cent to be added for these items. The total estimate of the Imhoff tank-trickling filter plant for a city of 55,000 population is 431,710 dols. This is equivalent to 7·85 per capita, or 78,500 dols. per million gallons per day for the assumed flow of 5·5 million gallons.

TABLE I.

Estimated Cost of Imhoff Tank-Trickling Filter Plant.

	Cost excl. eng'g and administration total.	Unit cost excl. eng'g and administration per capita.	Unit cost excl. eng'g and administration per m.g.d.
Grit and chamber screen	$10,000	$0·18	$1,818
Venturi meter chamber	3,000	·05	545
Imhoff tanks, including air lifts for sludge	64,500	1·17	11,720
Air compression equipment	800	·01	145
Sludge beds, including underdrains	4,800	·09	873
Trickling filters 10 ft. deep (2·75 acres)	188,500	3·43	34,300
Dosing tanks and apparatus	16,600	·30	3,020
Secondary settling tanks	9,000	·16	1,637
Sludge pumping equipment and building	2,000	·04	364
Conduits and pipe lines, including overflow	10,600	·19	1,925
Effluent channel	1,300	·02	236
Roadways	9,100	·17	1,655
Laboratory building and equipment	15,200	·28	2,762
Grounds, trees, planting, &c.	1,700	·03	309
Miscellaneous work, 4 per cent of total, excluding land	13,300	·24	2,420
Land	25,000	·45	4,550
Total	$375,400	$6·81	$68,279
Add 15 per cent. for engineering and administration	56,310	1·04	10,221
Grand total	$431,710	$7·85	$78,500

For 55,000 persons equals $7·85 per capita.
For 5,500,000 gallons per day equals $78,500 per m.g.d.

Activated Sludge Plant.—The estimated cost of the activated sludge plant is given in Table 2. In addition to the features already described, it will be noted that several items have been included to make the plant complete. As stated in the case of the trickling filter plant, the item of $25,000 for land includes about 117 acres. It may not ultimately prove necessary to isolate the activated sludge, in which case a credit in favour of this plant should be made on account of the small area of land required. In this case, as in the other, 15 per cent has been added to cover the cost of administration and engineering charges. It will be seen that the total cost of the

activated sludge plant is $313,880, which for a population of 55,000 persons is equivalent to $5·71 per capita, and $57,100 per million gallons per day.

TABLE II.

Estimated Cost of Activated Sludge Plant.

	Cost excl. eng'g and administration, total.	Unit cost excl. eng'g and administration per capita.	Unit cost excl. eng'g and administration per m.g.d.
Grit chamber and screen ...	$ 10,000	$0·18	$ 1,818
Venturi meter and chamber ...	3,000	·05	546
Sewage aëration tanks	78,100	1·42	14,200
Sludge aëration tanks, including air lifts	17,500	·32	3,180
Sedimentation tanks, including air lifts	8,300	·15	1,510
Air compressing equipment ...	22,600	·41	4,110
Air meters—2	700	·01	127
Air washer—1	600	·01	109
Power house	29,700	·54	5,400
Sludge beds, including underdrains	31,400	·57	5,710
Conduits, pipe lines and overflow	10,000	·18	1,818
Effluent drain	1,300	·02	236
Roadways...	8,300	·15	1,510
Laboratory buildings and equipments	15,200	·28	2,760
Grounds, trees, planting, &c. ...	1,700	·03	309
Miscellaneous work, 4 per cent. of total, exclusive of land	9,540	·17	1,735
Land	25,000	·45	4,540
Total	$272,940	$4·94	$49,618
Add 15 per cent for engineering and administration ...	40,940	·77	7,482
Grand total	$313,880	$5·71	$57,100

For 55,000 persons equals $5·71 per capita.
For 5,500,000 gallons per day equals $57,100 per m.g.d.

COST OF OPERATION.

Trickling Filter Plant.—An estimate has been made of the cost of operation of the trickling filter plant, based principally on the experience at Fitchburg, for the years 1915 and 1916.

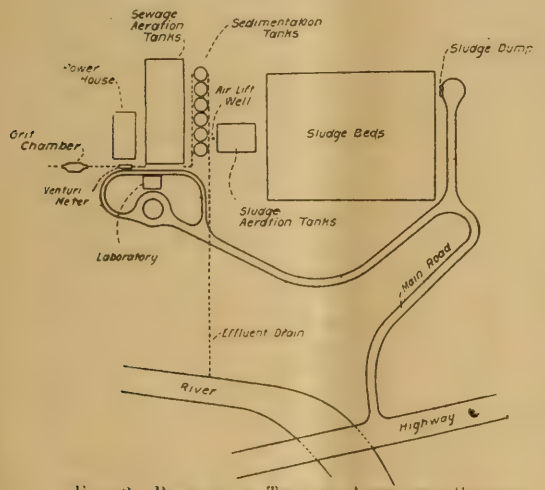

Fig. 2.—Plan of a Typical Activated Sludge Plant for Sewage Treatment.

The estimate of annual operation cost of the hypothetical Imhoff tank-trickling filter plant to serve a population of 55,000 is given in Table 3.

TABLE III.

Estimated Annual Cost of Operation of Typical Imhoff Tank-Trickling Filter Plant.

General, including administration	$2,200
Laboratory	1,700
Grit chamber	1,650
Imhoff tanks	3,120
Trickling filters	2,020
Secondary tanks	1,650
Sludge beds	1,470
Care of grounds	1,250
Miscellaneous	2,020
Total	$17,080

5·5 m.g.d. equals 2·005 m.g. treated equals $8·50 per m.g.
55,000 persons equals $0·31 per capita.

Activated Sludge Plant.—The estimated annual cost of operation of the activated sludge plant is shown in Table 4. Nearly half of the annual operating cost is for electric power, required for compressing the air. It was estimated that in addition to the air required for sewage aeration one-fifth as much would be required for sludge re-aeration and for operating the air lift pumps. The total annual cost of operation amounts to $40,140, which is equivalent to $20 per million gallons treated, or 73 per cent per capita, based on 55,000 persons.

The item for power is estimated on the assumption that it can be obtained at 1c per kw.h. For many places this is a low price, while for others it is high.

TABLE IV.

Estimated Annual Cost of Operation of Typical Activated Sludge Plant.

Item.		Annual cost.
General, including administration. ...		$2,200
Laboratory		1,700
Grit chamber		1,650
Tank treatment—		
One engineer foreman at $4 per eight-hour day, 312 days	$1,248	
Three engineers at $4	3,744	
Four labourers at $2·50	3,120	
Repairs	1,278	
		9,390
Sludge drawing and disposal—		
Foreman part time	$375	
Two labourers at $2·50, 312 days each...	1,560	
One team at $6, 312 days	1,872	
Supplies and repairs	603	
		4,410
Electric power at 1c. per kw.h.		17,040
Care of grounds		1,250
Miscellaneous...		2,500
Total		$40,140

5·5 m.g.d. equals 2,005 m.g. treated equals $20·00 per m.g.
55,000 persons equals $0·73 per capita.

COMPARISON OF COSTS.

For the final comparison of costs the interest and depreciation have been computed for both plants, and the total annual cost, made up of operating expenses and interest and depreciation, has been capitalised at 4 per cent, and added to the construction cost (Table 5). The result is decidedly in favour of the Imhoff tank-trickling filter plant, in spite of the fact that the estimates of operation of the activated sludge plant have been kept low, probably lower than is justified, that there might be no danger of inflating this cost to the disadvantage of the new process. To eliminate this difference it will be necessary to decrease the operating expenses of the activated sludge treatment by about $11,000, or to decrease them a portion of this amount, and in addition thereto to decrease the construction cost materially.

TABLE V.

Comparison of Costs of Imhoff Tank—Trickling Filter Plant and Activated Sludge Plant.

Item.	Trickling Filter Plant.	Activated Sludge Plant.
Operating expenses	$17,080	40,140
Interest and depreciation*	26,760	19,780
Total annual cost of treatment ...	$43,840	$59,920
Total annual cost of operation per m.g.	21·84	29 85
Total annual cost of operation per capita	0·80	1·09
Expenses capitalised at 4 per cent	1,096,000	1,498,000
Construction cost .	431,710	313,880
Total	$1,527,710	$1,811,880
Difference...		284,170

*Interest at 4 per cent depreciation—sinking fund at 2½ per cent.

At the present time much attention is being given to methods of converting the sludge into marketable fertiliser. There is reasonable agreement among investigators that activated sludge contains a greater proportion of fertilising ingredients than the sludges obtained from most other processes of sewage treatment. If the sludge can be converted into commercially dry powder, containing only 10 per cent moisture, there is good evidence of a market for it at a moderate price.

If the cost of preparation and sale of sludge should be no more than the return from such sales, the re-

[illegible] in the foregoing estimates of operation and [illegible] would be $5,030 and $36,000 respectively. If this process should be even more successful, and a [illegible] of $2.00 per ton, or, say, $1.00 per 1,000,000 gallons should be allowed, the saving thus effected would account for—

Profit on sludge	$2,607·50
Cost of sludge disposal as per previous estimate	5,030·00
Interest and depreciation on sludge beds	2,270·00
Total	$9,307·50

In addition to this annual saving there would be also the saving in investment cost of $36,000.

Even this profit and saving would not be enough to make the cost of the activated sludge process to that of the Imhoff tank-trickling filter process, but the profit of $1·00 per 1,000,000 gallons may be satisfactorily exceeded. In any event, this subject should receive, as indeed it is receiving, most careful investigation.

In spite of the fact that it appears to be somewhat more expensive than other processes, the activated sludge treatment should not be rejected on the ground of cost without giving full consideration to its advantages. It may be that as an oxidising process it will always be more expensive than the trickling filter, but it may have advantages more important than this disadvantage.

RELATIVE AREAS OF LAND.

It is assumed that the sludge from the activated sludge process is to be dried and disposed of by means of sludge beds, the total area of land used for the activated sludge plant will not differ greatly from that actually used for the trickling filter plant.

The estimated area required for the typical activated sludge plant is 10 acres, or nearly 2 acres less than that required for the typical trickling-filter plant, which is estimated at 11·8 acres. If some other form of sludge disposal were used the area would be materially reduced. As already stated, the activated sludge plant may have some advantage in not requiring as much land for isolation as the trickling-filter plant. The corresponding reduction in cost would be to the advantage of the former.

LOSS OF HEAD NECESSARY IN PLANT.

One of the important advantages of the activated sludge process is the small loss of head required for the passage of the sewage through the plant. The resulting saving in cost of sewerage works, such as pumping stations and long outfall or intercepting sewers, may be sufficient to make the adoption of the activated sludge process imperative.

ODOURS.

There is some sentiment hostile to an Imhoff tank-trickling filter plant because of the fear of the dissemination of objectionable odours. That objectionable odours are noticeable in the immediate vicinity of such plants cannot be denied. On the other hand, there is good evidence that they are not noticeable except very close to the treatment plants.

The activated sludge plant appears to have some advantage in this direction. Odours may be noticeable in the immediate vicinity of the aëration tanks, and it is possible that objectionable odours may be given off from some portions of the sludge drying and handling process, whatever it may ultimately be. It is probable, however, that the danger from this source will be less than from the Imhoff tank-trickling filter plant.

MOTH FLIES.

The moth flies, so prevalent at certain seasons of the year, are quite objectionable close to the filters, although they are rarely found more than a few hundred yards away from them. While this cause of annoyance may be kept under reasonable control, it is doubtful if it can be wholly eliminated. The activated sludge plant does not seem to be a suitable breeding ground for these pests, and therefore has an advantage over the filter.

QUALITY OF EFFLUENTS.

[illegible] that the activated sludge process is capable of producing a more highly oxidised effluent than the trickling filter, as ordinarily built and operated, that it will eliminate a much greater percentage of bacteria, and that in appearance its effluent will be much superior to that of the filter. This is a material advantage under certain circumstances, but alone should not be allowed to result in the adoption of a more expensive process than the [illegible] trickling filter [illegible].

COMPLEXITY OF ACTIVATED SLUDGE PROCESS.

A disadvantage of the activated sludge process in the minds of many who have studied it is its apparent complexity and need for careful and skilled supervision. While it has been contended by some that this process is exceedingly simple, and one which can be operated by a workman of ordinary intelligence, the consensus of opinion appears to be to the contrary. The author's experience in operating several small experimental plants leads him to feel that of all processes of sewage treatment in practical use in this country to-day, this is by far the most difficult to operate, and that it will require the skill of a well-trained engineer or chemist to insure continued satisfactory results with it.

CONCLUSIONS.

At the present time it appears that the Imhoff tank-trickling filter process is a less expensive means of oxidising the organic matter of sewage wastes than the activated sludge process, where oxidation alone is considered. If the areas of land required for isolation, the loss of head in the plant, the danger of objectionable odours, and of the fly annoyance, and other disadvantages of the trickling filter process are of marked importance in any specific case the balance may be decidedly in favour of the activated sludge process, even in its present state of development.

The activated sludge process should receive, and is having, much study. There are many problems connected with it which may be solved in such a way as to put it in a much more favourable position. It is to be seriously hoped that investigations will go forward until the process is thoroughly perfected. In the meantime, also, further attention should be given to improvement in the design and operation of the oldest processes of sewage treatment.

HOUSING OF MUNITION WORKERS.

THE PROVISION OF GARDEN SPACE.

In the House of Commons on the 2nd inst., Mr. Rowntree asked the Minister of Munitions what steps are being taken to secure that in those cases in which permanent dwellings are erected for the housing of munition workers good town-planning standards are adhered to, more especially in regard to the giving of ample frontages to secure air and light and the provision of garden space around the dwellings, so that the members of the families of munition workers may be enabled to cultivate food for their own consumption.

Dr. Addison: It is impossible within the limits of an answer to a question to give the particulars for which my hon. friend asks, but I can assure him that due regard is paid, in connection with the Ministry's permanent housing schemes, to the considerations he raises, so far as they are consistent with the necessity for economy and for rapid construction.

Mr. E. Harvey: Are these town-planning schemes submitted to the Local Government Board?

Dr. Addison: They are recommended to the Local Government Board in the first place, and they are inspected.

Essex Water Supplies.—In the course of the last meeting of the Essex County Council, the Public Health and Housing Committee reported that Dr. J. C. Thresh, the county medical officer, had recently investigated a complaint with regard to the water supply at Terling, which he found to be contaminated. No ill-effects had resulted from the use of the water, and the source of pollution had now been removed. The committee also reported that the military authorities had recently questioned the purity of the Colchester water supply. Dr. Thresh accordingly examined all the sources and found that the water was of excellent quality, and that the question had evidently arisen through lack of knowledge of the peculiarities of Essex deep-well waters. The committee intimated they had received a report from the county medical officer stating that he attended a conference at the offices of the Local Government Board with regard to the question of the quality of the water supplied by the Tendring Hundred Water Company, but that the only remedy which he could suggest was an expensive one and that the Board were loath to insist upon it under present financial conditions, although they could suggest no alternative. The committee now understood that the water company were constructing an experimental filter.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

SURFACE-WATER DRAINAGE: FLOODING.—In *Ballard v. Leek Urban District Council* (Chancery Division, Mr. Justice Eve; March 30th), the plaintiff, Mrs. Ballard, claimed an injunction to restrain the council from permitting water to flood two of her fields abutting on the Buxton-road, Leek. It was alleged that the flooding was attributable to an overflow pipe from the Leek Moor Brook, and was due to too much water coming down the surface-water sewers. The council denied liability on the ground that the brook was a natural watercourse, for the condition of which they were not responsible, and that the overflow pipe had neither been put down nor maintained by them. Evidence was given by Mr. William Barclay Chancellor, chief assistant surveyor to the council; Mr. Cuthbert Chalmers Brown, the former chief assistant surveyor; and Mr. William Beresford Martin, another assistant surveyor, to the effect that the overflow pipe was a very old pipe, and that during the periods the witnesses respectively were with the council nothing was done with regard to the pipes beyond cleaning out the natural watercourse. Mr. William Ernest Beecham, the present surveyor to the council, also gave evidence, stating that he had searched the records from 1901 onwards, but could find no reference to any draining work done by the council in the fields; that neither he, nor any one so far as he knew, had made a hole in or destroyed part of the bottom of the culvert taking the surface water; that it was fifty years since the Leek Moor Brook pipe and the overflow pipe were in use; and that it was not a fact that the council had secretly used the overflow pipe for taking water through the plaintiff's fields. Mr. Justice Eve, however, granted the injunction asked for.

WATER SUPPLY: PUBLIC HEALTH (WATER) ACT, 1878, SEC. 6.—In *Hartismere Rural District Council v. Miles and Others* (Hartismere Petty Sessions, March 26th), the defendants (who were trustees of the Gospel Hall, Batesdale) were summoned for permitting a house of rest for foreign missionaries, connected with the hall, to be occupied without obtaining the council's certificate that a sufficient supply of wholesome water was provided within a reasonable distance. Mr. Lazarus Moss, the inspector of nuisances to the council, gave evidence that on six occasions he took samples of water from the well on the premises, and from that on the adjoining premises, which samples were afterwards analysed. Dr. Barnes, the medical officer of health, also gave evidence, stating that he had analysed the samples in question, and found them unsatisfactory, showing excess of organic matter. On behalf of the defendants it was stated that the house had been erected at a cost of £400 for the benefit of infirm and decayed ministers at home on furlough from foreign parts, and was occupied by such a person rent free. It was also alleged that the well on the adjoining premises had been cleaned out, and the water now being used from it was wholesome (though no evidence was given as to this); and it was submitted that this was not a case in which the Bench should exact the "pound of flesh." The magistrates, however, decided that this had been a contravention of section 6 of the Public Health (Water) Act, 1878, and that they had no option but to convict. They imposed a fine of 20s., with 25s. costs.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as nome de plume. The letter X. combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

WATER SUPPLY: ENTRY ON PREMISES.—"Water" writes: Referring to your reply to my query as to power of entry for taking a sample for analysis (at p. 332 *ante*), the council referred to is an urban district council, and is not invested with the powers of sec. 7 of the Public Health (Water) Act, 1878. Do you think the taking of a sample of water for analysis could be reasonably brought within sec. 91 of the Public Health Act, 1875—"Any premises in such a state as to be a nuisance or injurious to health"? The medical officer of health is of the opinion that the water on certain premises should be analysed, owing to the occupier carrying on a dairy business, and we do not know yet whether the water is good or bad. There is no question of there being ample water in the well for the occupier's use, but what we want to get at is whether it is a good water, but he refuses power of entry for taking a sample. Of course, if it can be brought under sec. 91 of the Public Health Act, 1875, the course to adopt is clear under sec. 102; if not, the question is how to obtain a sample. Other well waters in the vicinity have been condemned on analysis, but no objection was met with in taking these samples for the purpose. I see in Lumley's notes to sec. 11 of the Public Health (Water) Act, 1878, that specific evidence is required by the Local Government Board (before granting powers under sec. 7) that the powers of secs. 62 and 70 of the Public Health Act, 1875, have been found insufficient in practice. I do not at present see that secs. 62 and 70 of the Public Health Act, 1875, can be applied to this case, although a proper supply under sec. 62 must, I take it, be a pure supply. But we cannot prove this in our case without analysis; also sec. 70 relates to a polluted water, which is not at present proved.

I think it is very doubtful whether sec. 91 of the Public Health Act, 1875, can be applied to this case; and, in my opinion, neither sec. 62 nor sec. 70 is applicable. I quite agree with my correspondent that a polluted supply is not a "proper supply"; but, as he points out, the pollution (if it exists) cannot be proved without analysis; and neither of these sections provides any machinery for this.

HIGHWAY: MATERIALS FOR REPAIR: QUARRY.—"W. S." writes: A quarry has been worked by a rural council (and before them by the Highway Board) for many years for stone to repair the roads. No one seems to know how the quarry was first begun, and the township award is evidently missing. Can the lord of the manor interfere, seeing the council have exercised their rights of quarrying undisturbed for so many years?

I do not think the lord of the manor can interfere, if the council and their predecessors have exercised their rights without interruption for twenty years. Assuming that the quarry was allotted to the parish by an award either under a special Inclosure Act or under the General Inclosure Act, 1845, copies of the award would, in ordinary course, be deposited with the clerk of the peace for the county, and with the churchwardens of the parish.

Rebuilding in Dublin. Some progress is being made with the rebuilding of Dublin's devastated area. A good number of plans have been passed by the committee of the corporation concerned. The difficulty at present is in securing the permission of the Ministry of Munitions for the import of all required material. This Ministry has, of course, the power to put a veto on any building operation, and has frequently exercised it in England, so that Dublin is not the only sufferer from the necessities of the time. People (remarks the *Irish Times*) are apt to forget that into the construction of modern building the use of steel enters largely, and the present demand for steel is huge, not only for munitions, but for machinery, railways, and a multitude of supplies required for war purposes. The Chief Secretary some months ago declared that he would see that nothing interfered with the import of material for rebuilding in Dublin, but, of course, his intentions cannot run counter to the fulfilling of war demands. The goodwill of the Minister of Munitions, however, has been demonstrated, not only by his good offices in allotting to Dublin a quantity of steel for building purposes, but by his securing it at a remarkably favourable price. Work in the wrecked area is proceeding on the foundations for new buildings, for Dublin is free to build when material becomes available. It is in Henry-street that most progress has to have been made with the rebuilding of the city.

Municipal Work In Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Birmingham T.C.—The Health and Housing Committee have three works in view at the close of the war. They decide to reconstruct Witton Fever Hospital, and make additions to the smallpox hospital at Winson, the cost of which is estimated at £48,000, and would will be two years in completion. An observation block is desirable at Little Bromwich Fever Hospital, the expense being estimated at £3,500, and a disinfecting station, to cost (including land) £6,000.

Dewsbury T.C. Plans are being prepared for public conveniences in Long Causeway.

Newcastle-on-Tyne T.C.—The town council have approved a recommendation of the Town Moor and Parks Committee to allocate a site for the extension of the Royal Victoria Infirmary. As there are public rights in the proposed site, a Parliamentary Bill will have to be promoted.

Nottingham T.C.—The town council have confirmed the recommendation of the Public Baths Committee to purchase the Turkish baths in Upper Parliament-street for £5,300.

HOUSING AND TOWN PLANNING.

Romford R.D.C.—It has been agreed to postpone the inspection of the town-planning scheme until after the war.

MOTOR TRANSPORT.

Barnstaple R.D.C.—The highways surveyor, Mr. A. V. Richards, reported that he had great difficulty in getting horses to haul materials, and Mr. Andrew expressed the opinion that the council ought to acquire a steam lorry. With steam lorries, which were used in many parts of the country hauling the material, they could repair the roads in a very short time.—The chairman: I suppose you realise the great cost it would represent to the rates? Mr. Andrew: It would really mean a great saving, because it costs 10s. or 12s. a day at present for a man and a waggon carting. He reminded the council that they found the necessary money to buy rollers and urged that it was a very good outlay.

Blackpool T.C. It has been decided to purchase for £750 an electric motor chassis for the removal of refuse.

Cannock U.D.C.—A steam motor wagon is to be purchased for £830.

Derby T.C. It has been agreed to purchase an electric tipwagon from the General Vehicle Company for £1,200.

Essex C.C.—The council have bought a second hand steam wagon for £140.

Edinburgh T.C.—The Plans and Works Committee recommend the city council to accept the estimate of John Morris and Sons (Limited), Manchester, for a new petrol motor for engine, to replace one taken over by the Government. The cost will be about £1,000.

Haslingden T.C. A sub-committee has been appointed to consider the report on the question of motor traction lorries for departmental work.

Ilford U.D.C.—The council are recommended to obtain another 2-ton electric wagon for the use of the cleansing department. Inquiries are being made with respect to a second hand steam wagon.

Stanhope U.D.C. The question of purchasing a motor ambulance is being considered.

Stockton-on-Tees T.C.—The town council are recommended to purchase a steam steam wagon, with interchangeable body and tipping gear, at a cost not exceeding £445.

REFUSE COLLECTION AND DISPOSAL.

Westhampnett R.D.C. The council have accepted the tender of Mr. A. C. Wingham of Selsey for the removal and disposal of the house refuse at Selsey for three years, at £120 per annum.

ROADS AND MATERIALS.

Alton R.D.C.—With reference to a complaint that a quantity of stone had been taken from the roadsides by the military authorities, it was stated on behalf of the latter that it had been used on part of Bramshott Common, where motor transport wagons had sunk down owing to the soft nature of the soil. Colonel Dikinson, of the Canadians, added that in Western Canada farmers put the stones by the sides of the roads and were much obliged to people for carrying them off. The council were amused at this explanation. It was stated that the matter would be arranged satisfactorily.

Bath T.C.—At the meeting of the General Purposes Committee a letter from the Road Board was fully considered, and it was resolved that the council should not themselves carry out the specified work of repair and surface tarring to the roads at the War Hospital, but that they should suggest to the Board the advisability of obtaining tenders locally for the work.

Birmingham T.C.—Several schemes of extension have been scheduled by the Tramways Committee among the after-war projects. The most important is the construction of new tramways authorised in 1914. The cost is estimated at £142,455, with £16,259 additional for the land acquired. The committee also propose the repair and reconstruction of a considerable portion of the existing tramways, badly out of condition, due to shortage of labour and materials. The expenditure involved is £40,000, and it will be met out of tramways reserves.

Guildford T.C.—The town council have adopted the suggestion of the borough surveyor, Mr. E. L. Lunn, to repair certain roads at an estimated cost of £170, and to carry out retarring at an estimated cost of £700. The borough surveyor also reported on the unsatisfactory condition of the rolling-stock at the depots. Only one mud-cart was available, and he had given instructions that only such mud as could be removed at once, either by the limited carriage available or by wheelbarrows, should be accumulated in the channels of the roads. It has been decided not to affect any private street works for the present, but to ask certain owners to make the roads reasonably fit for use.

Haverhill U.D.C.—The Gas Committee recommend that certain suggestions made by Mr. J. W. Auchterlonie, of Cambridge, with respect to the gasworks should receive immediate attention, and that others should be postponed till after the war.

Helston T.C.—The borough surveyor, Mr. W. J. Winn, reported that there had been a considerable saving effected by the town council adopting their own carting, and the new system had proved a great success.

Holland (Lincs) C.C.—The South Holland surveyor, in a statement as to the main road expenditure for the year, stated that the cost had been £5,198, being £172 under the estimate. The cost per mile had been £70, as against £140 three years ago. For North Holland, the expenditure for the past year was £4,745, being £324 under the estimate.

Southwick U.D.C.—In view of the increased cost of the maintenance of the Upper Shoreham road, due to the heavy traffic, it has been decided to apply for a grant from the Road Board and the county council.

Woolwich B.C.—The council have informed the Ministry of Munitions that they regret they are unable to agree to the suggestion that the doublihg of the tramway track in Plumstead-road should be carried out immediately unless the department are prepared to give a definite undertaking that they will contribute one-half of the balance of the cost of the subsequent widenings, over and above the contribution of £15,000 offered by the county council.

SEWERAGE AND SEWAGE DISPOSAL.

Doncaster T.C.—The Sewage Disposal Committee propose to obtain a pumping plant to deal with the

sewage of houses adjoining Thorne-road and Armthorpe-lane.

Hetton U.D.C.—It has been agreed to carry out surface-water drainage in Wear-street and other roads.

Leek R.D.C.—The council are making application to the county council for financial aid to deal with the sewage of Longnor.

WATER, GAS, AND ELECTRICITY.

Marylebone B.C.—The Electricity Committee propose that certain economisers at the electricity works should be renewed, at an estimated cost of £2,000.

Mexborough U.D.C.—The electrical engineer has received instructions to proceed with the preparation of the scheme for plant extension in connection with the electricity undertaking. The cost is expected to be about £9,500.

Plymouth T.C.—The Local Government Board have intimated that under present circumstances they must decline to sanction a loan for stoves and meters for the Devonport gas undertaking.

Retford T.C.—A member of the corporation has called attention to the fact that, in the event of the water supply through any unforeseen circumstances failing, the town has nothing to fall back upon. The present supply is an excellent one, and meets all the requirements of the inhabitants. The Water Committee have promised to give the matter consideration.

Scarborough R.D.C.—A sub-committee has been deputed to consider the question of the purchase of the waterworks at Ravenscar.

Stafford T.C.—It is estimated that there will be a balance of £2,000 in aid of the rates from the gas, electricity, and water undertakings.

Swansea T.C.—The Waterworks Committee have received an offer from the Graigola Merthyr Company to lease the minerals underlying the Lower Lliw Reservoir. Quite recently the corporation became the undisputed owner of the minerals, the estimated value of which is over £80,000. The engineer, however, is of opinion that there is a possible risk to the reservoir through any underground workings, and consequently the offer cannot be entertained unless the company is prepared to give an undertaking against damage through subsidence.

Willesden U.D.C.—The Electricity Committee recommend the council to obtain a loan for new substation machinery and cables.

MISCELLANEOUS.

Blackpool T.C.—It is now definitely announced that there will be no opposition from any quarter to the Blackpool Improvement Bill, which will come before a Committee of the House of Commons in the last week of this month. The Bill authorises considerable promenade extensions and improvements, altogether costing about £250,000, after the war.

Helensburgh T.C.—For some years the burgh cleansing department have had a special service for the collection of waste paper from shops and offices. Fairly good financial results have been attained recently. In the beginning of the present year a ladies' committee was formed for the purpose of collecting newspapers and waste paper generally from householders, with a view to helping war relief funds. The town council has given every assistance to the committee. Since February up to date over 35 tons have been collected and sold, the amount realised being over £90.

Preston T.C.—The Waste Paper Committee have divided £715 among local charities during the past twelve months. A sum of £115 was raised during February and March.

Salford T.C.—A special committee has been appointed to consider and report as to the advisability of diverting the river Irwell so as to shorten its course in the valley below the Crescent, and as to the utilisation and improvement of any land thereby made available for such public purposes as might be considered desirable. It was suggested that if the proposed scheme were carried out it would be possible to construct a large road from the Crescent to some point adjacent to the tramway centre.

Stafford T.C.—In consequence of the enlargement of the borough by the inclusion of several neighbouring areas, the Finance Committee recommended that the salary of the borough engineer, Mr. W. Plant, should be increased from £400 to £500 a year.

THE "SAFETY FIRST" PROPOSALS.

CHINGFORD COUNCIL AND "A WASTE OF PAPER."

The circular of the "Safety First" Council suggesting that local authorities should agree to the reversal of the rule of the footpath, and give effect to it by posting placards in their district, was before the last meeting of the Chingford, Essex, Urban District Council.

Councillor Holden: It is a gross waste of paper. ("Hear, hear.") I suppose they send these circulars all over the country.

Councillor Brown: Instead of wasting labour in this way, they might direct it into more useful channels.

The Clerk: They send another letter dealing with street refuges, whitening of kerbs, snow cleansing, &c. (Laughter.)

Councillor Brown: We understand our duties and carry them out in the best interests of the district.

Councillor Holden: They ought to be prosecuted under the Defence of the Realm Act for wasting paper; it is scandalous.

The Chairman: What will you do with the letters?

A Member: Put them on the file.

Councillor Holden: Put them on the fire. (Laughter and "Hear, hear.")

Councillor Brown: Send them to the Paper Commission. (Laughter.)

TOWN PLANNING AND ROAD IMPROVEMENT.

AN INTERESTING PAPER.

At a meeting of the Town Planning Institute, to be held at the Surveyors' Institution, 12, Great George-street, Westminster, on Friday next, the 20th inst., at 6 p.m., Mr. Rees Jeffreys will present a paper dealing with the subject of road construction and improvement by means of town planning schemes. The attendance of visitors is cordially invited, and it is hoped that road engineers especially will be well represented at the gathering.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATION FOR LOAN.

Merthyr T.C.—£2,700 for the construction of a sewer.

FORTHCOMING INQUIRIES.

APRIL.	£
17.—**Mansfield.** For the purpose of a street improvement (Mr. A. G. Drury) ...	490
18.—**Wombwell.** For the purposes of the gas undertaking (Mr. A. G. Drury) ...	16,778

FOR OTHER ADVERTISEMENTS

See End of Paper.

BOROUGH OF CHORLEY.

TEMPORARY ASSISTANT.

Wanted Assistant Surveyor in the Borough Surveyor's Department. Applicants must be ineligible for military service, and the person appointed will be principally engaged upon work in connection with Town Planning. Applications, endorsed "Surveyor's Assistant," stating age, experience, and salary required, with copies of not more than three recent testimonials, must be sent to the undersigned not later than April 27th.

JNO. MILLS
(3,382) Town Clerk.

TO ASPHALTE CONTRACTORS.

The Battersea Borough Council invite Tenders for the Supply of Materials and Work for Re-surfacing a Roadway with Asphalte Macadam. Specification and Form of Tender may be obtained from the undersigned.

Tenders, endorsed "Asphalte," must be delivered by noon on Monday, 30th April, 1917.

W. MARCUS WILKINS
Town Clerk.

Town Hall, Battersea.
April, 1917. (3,386)

PERSONAL.

Mr. W. E. Worcester, of Norwich, has been appointed surveyor to the Swaffham Rural District Council.

Mr. G. Atkinson, Town Hall, Croydon, has been elected an associate member of the Institution of Civil Engineers.

Mr. F. Hargreaves, surveyor to the Consett Urban District Council, has been voted a bonus of £25 a year during the war.

Mr. H. P. H. Morgan, municipal offices, Cheltenham, has been admitted as a student of the Institution of Civil Engineers.

Mr. G. A. Mallard has been appointed surveyor to the Accrington Urban District Council, at a salary of 27s. 6d. per week.

Mr. E. Roman, of Mumbles, Swansea, has been appointed temporary assistant in the city surveyor's department, Sheffield.

Mr. H. V. Newman, deputy engineer to the Pudsey Urban District Council, has joined up as a technical officer to a Labour Battalion in France.

The Late Mr. Baldwin Latham.

As already announced in these columns, Mr. Latham passed away on the 23rd ult., aged eighty-one. He was a recognised authority on sewerage and water supply, and he acted as adviser on these matters to numerous public bodies.

Mr. Percy Parker, city surveyor of Hereford, has been transferred from the class of associate member to that of member of the Institution of Civil Engineers.

Mr. E. S. Oldfield, engineering assistant to the Pontypool Urban District Council, has accepted a commission in the Royal Engineers (Inland Water Transport Section).

Mr. F. W. Aitken, surveyor to the Crook Urban District Council, has joined the Army, and the council have granted his wife £50 a year to Mrs. Aitken and a bonus of £10 to the latter.

Mr. J. Clinton, surveyor to the Luddenden Foot Urban District Council, has been appointed surveyor to the Barkisland-Wharteldale Urban District Council, in succession to Mr. H. Riding.

Mr. S. S. Eccles, M.I.C.E., surveyor to the Totnes Rural District Council, has been voted a war bonus, and the retiring surveyor, Mr. H. Vickery, has been heartily thanked for the manner in which he has served the council.

Mr. J. E. Walker, borough surveyor of Newark, has joined the Army, and will proceed abroad to undertake engineer's work in connection with light railways. During his absence the duties will be performed by Mr. C. J. Hartigan, engineer-in-charge of the Clydebridge Steel Works Extension.

Mr. W. S. Cleg, surveyor to the Littlehampton Urban District Council, has joined the Army, and will probably be engaged in superintending road-making in France. Mr. R. Brooker, the inspector of nuisances, has been appointed temporarily to the office of surveyor at an increased salary.

Mr. D. Travis, chief sanitary inspector and cleansing superintendent of Halifax, has resigned, but his services will be retained as a part-time officer in connection with the inspection of canal boats, and fertilising and feeding stuffs, and in the oversight of the land and property of the Cleansing Committee.

Mr. W. O. Hughes, surveyor to the Bettws-y-Coed Urban District Council, who joined the army about eighteen months ago, applied to the council to be reinstated, as he had been wounded in action and was now classified C2 in consequence. The council decided to take no steps to fill the vacancy until after the war.

Mr. George Watt, burgh surveyor of Inverurie, who had enrolled for National Service, has, it was stated at the last meeting of the town council, been asked to report himself. It was pointed out that if the council considered that Mr. Watt was of more national service in his present position they could lodge a profest, and the matter would be referred to the local Sub-Commissioner for National Service for decision. The council agreed to lodge a protest.

OBITUARY.

Major Henry Macaulay, formerly borough surveyor of Kingston-on-Thames, has died at Kingston-hill, at the age of 87. He was appointed to the position in 1876, in succession to Mr. Dunscombe, and held it for thirty years, his services being retained as consulting architect when he retired. Major Macaulay prepared the plans for the Kingston sewage disposal works. It was originally intended to place the undertaking close to the river, but ultimately the Downhall meadows were acquired, and by placing the works further back it became possible to construct the Canbury-gardens promenade, which is now one of the beauty spots of the borough. Other works designed and carried out under the supervision of Major Macaulay were the central electric lighting station and a scheme of workmen's dwellings. Subsequently Major Macaulay prepared plans for the improvement of the sewage effluent, and this was carried out at a cost of £10,000. He was honorary architect of the Kingston Victoria Hospital, which was built, and has been twice enlarged, from his plans. Major Macaulay, who was a very popular figure in the town, was an enthusiastic supporter of the Volunteer movement from its inception, and rose to the rank of Major in the 3rd Royal Lancashire Regiment.

Allowances to Municipal Officials on Service.—On Tuesday at a meeting of the Matlock Urban District Council, the question of allowing the town surveyor, Mr. J. Turner, £100 a year while in the Army was discussed at length. The Local Government Board wrote giving sanction to the payment of the grant.—The chairman explained, in reply to public criticism, that at the outset of war the council passed a resolution to make up the difference of the wages from the rates.—Councillor Shenton said he did not object to that, but the difference should be made between what the employee received and the total of wages. The reply was that the surveyor had to find his own messing allowances.—Councillor Wildgoose and others held that the council was obliged to keep to their contract. The arrangement for the surveyor was also announced to have saved the council £101 per annum, as they had not had to appoint a fresh surveyor.

Housing at Rosyth.—Authority for the erection of 1,000 houses at Rosyth was sought by the Scottish National Housing Company, Limited, at the Dunfermline Dean of Guild Court on Tuesday. It was stated that the capital value of the houses was something like £400,000. The burgh engineer, Mr. P. C. Smith, explained that they were to be of six different types in order to meet the needs of the prospective classes of tenants. In one type of houses the staircases were to be built of concrete slabs, with hollow between and held together by means of ties. He objected to the strength of the blocks and the type of the ties, and he further objected to the absence of wash-tubs in houses which had no wash-houses. It was agreed to pass the plans, the secretary of the company remarking that they would try to meet the burgh engineer's wishes, and that their architect would either convince Mr. Smith or Mr. Smith would convince the architect on the point as to the concrete blocks.

SURVEYORS' TRAVELLING FACILITIES.

THE ECONOMY OF MOTOR CYCLES.

At the last meeting of Stoke-on-Trent Town Council, on a recommendation of the Highways Committee to increase the salaries of certain officials and workmen in the highways department, Mr. Cooper alluded to the grant made to the Southern District surveyor of £50 per annum for the maintenance of a motor cycle, and asked whether that official was carrying out the wish of the council in the matter.

Mr. Sampson Walker replied that the motor-cycle was being used. Before this arrangement was entered into, the two district surveyors each had a horse and trap and a man, and the substitution of motor-cycles saved the corporation £150 a year. If the council thought the Southern District surveyor was not entitled to an increase of salary after three years, let them vote against it. If they thought the allowance for a motor cycle was wrong, let them deal with that in its proper order.

Mr. Scott said that the council made a good bargain when they made the arrangement about the motor cycles, and the borough surveyor gave them his assurance that they were being used. That ought to be enough for them.

Alderman Goodwin asked whether the Southern District surveyor bought his own petrol, whether he did his own repairs, and whether he paid any tram fares. He said he was informed that people in his position were allowed to ride on the trams free.

Mr. Sampson Walker: The answer to the first question is in the affirmative, and the second is also in the affirmative. With regard to the third, he has a pass, and that is to the advantage of the corporation. An amendment that the recommendation to increase the salary of the Southern District surveyor be deleted was lost, and the minutes were adopted.

COMMERCIAL MOTOR USERS ASSOCIATION.

A YEAR'S WORK.

Colonel R. E. Crompton, C.B., chairman, in presenting the annual report of the Commercial Motor Users Association at the fourteenth annual general meeting, referred to the close touch which the association kept with the naval and military authorities, giving its assistance to these services on many occasions. The association had been successful during the year in securing the abandonment of the proposed additional tax of 3d. a gallon on petrol for use in commercial motors, and had successfully urged that, in view of the great difficulty in securing supplies of coal for steam wagons owing to the great demand by the Navy, the Home Office should allow a considerable degree of latitude in the event of the emission of smoke before taking legal action. An important appeal case had been won, in which it was sought to prove that a steam wagon was a locomotive, and every Order and Regulation affecting commercial motor interests had been investigated. He drew attention to the rapid increase in membership, which during the past six years had increased from under 300 to nearly 2,000 users, representing over 30,000 commercial motor vehicles.

Timber, Plywood, and Woodwork.—In next week's issue there will appear a page advertisement which will give various particulars of timber, plywood, and woodwork which Messrs. C. Jennings & Co. have for sale. The page will be found useful for reference by all who make use of such goods. The firm's head office is at Pennywell-road, Bristol, but they have branches at Leicester, Porthcawl, and stocks warehoused at Swansea, Hull, Pembroke Dock, Neyland, Newcastle, Manchester, Liverpool, and elsewhere.

Water in Cellars and Stokeholes.—Those of our readers who have been troubled with water in cellars and stokeholes during the past winter will be well advised to remedy them while the weather is dry. We have heard of a stokehole to a greenhouse which was cemented carefully on one or two occasions, but, to the chagrin of the owner, it still flooded badly. Two years ago, however, a Pudlo cement rendering was given, and the result has proved beneficial, no water having appeared during the last two wet seasons.

MUNICIPAL EMPLOYEES AND NATIONAL SERVICE.

THE QUESTION OF REINSTATEMENT.

Adverse criticism was offered at the last meeting of the Derby Town Council concerning a decision of the Special Purposes Committee, that it was not practicable to guarantee to keep open the places of corporation employees accepting appointments under the National Service scheme, but that they should be reinstated if their posts were available. Mr. J. F. Bell contended that if the National Service army was, as had been represented, as important as the other army, the least the corporation could do was to agree to keep open the situations of the men volunteering, as they had done in the case of those in the regular forces. The decision was referred back.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. John S. Brodie, M.Inst.C.E., Borough Engineer and Surveyor, Blackpool.

METROPOLITAN DISTRICT.

A Metropolitan District meeting of the Institution of Municipal and County Engineers will be held at the offices of the institution on Friday, April 27th.

Programme.

6.30 p.m.—Meet at the offices of the institution, 92 Victoria-street, S.W.

Business:

1. To confirm minutes of previous meeting.

2. To discuss paper by Mr. Reginald Brown, entitled "The Dustbins of Greater London (The Problems connected therewith and Suggestions for their Solution)."

All members of the institution are cordially invited to attend.

N. Scorgie,
Hon. District Secretary.

Hackney.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Edward Whitwell, F.I.S.E., M.S.A., Engineer and Surveyor, Abersychan Urban District Council.

EASTERN AND NORTH-EASTERN DISTRICTS.

An Eastern and North-Eastern District meeting of the Institution of Municipal Engineers will be held at Peterborough on Wednesday, April 18th.

Programme.

12 noon.—Meet at City of Peterborough Electricity Generating Station, and inspect works, by kind permission of the engineer.

1 p.m.—Adjourn for lunch.

2 p.m.—Visit to Messrs. Barford & Perkins, Limited, Engineering Works, by kind permission of Mr. J. G. Barford.

Visit to City Museum if time allows.

4 p.m.—District meeting at Swiss Café, Narrow-street, when a paper, "Experiences in a Fen Rural District," will be read by Mr. A. W. Broker, district chairman.

Tea.

G. Belson Chilvers,
Hon. District Secretary.

Oundle, Northants.

GENERAL MEETING IN LONDON.

At a general meeting of the Institution of Municipal Engineers to be held in London on June 6th, Mr. Reginald Brown, M.Inst.C.E., engineer and surveyor to the Southall-Norwood Urban District Council, will present for discussion a paper entitled, "House Refuse: Its Calorific Value and its Possibilities."

The chair will be taken at 6.30 p.m.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR.—April 17th.—Crediton Rural District Council. £160-£175 with £25 for the provision and use of a motor cycle. Mr. William Pope, deputy clerk of Higher-street, Crediton, Devon.

STOCKKEEPER.—April 18th.—Corporation of Doncaster. 35s. per week. Mr. R. E. Ford, acting borough surveyor, Mansion House, Doncaster.

TRAMWAYS TRAFFIC SUPERINTENDENT.—April 23rd.—London County Council. £500 to £700 a year.—The Clerk, London County Council, Spring-gardens, S.W.

ELECTRICAL ENGINEER.—April 23rd.—London County Council. £1,200 to £1,500 a year.—The Clerk, London County Council, Spring-gardens, S.W.

GENERAL ASSISTANT.—April 24th.—West Suffolk County Council.—Mr. T. W. Morgan, acting county surveyor, County Surveyor's Office, Shire Hall, Bury St. Edmunds.

MUNICIPAL ENGINEER.—May 1st.—Municipality of Lahore, India. £1,000—£1,600 per annum.—Mr. H. P. Tollinton, deputy commissioner and president, Municipal Committee, Lahore.

TRAMWAYS DEVELOPMENT SUPERINTENDENT.—May 7th.—London County Council. £500 to £600 a year.—The clerk, London County Council, Spring-gardens, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Roads.

TENTERDEN.—April 16th.—For the supply of granite and other approved macadam, Kentish ragstone, and beach, for the rural district council.—Mr. W. L. C. Turner, surveyor, Council Offices.

RUNCORN.—April 16th.—For the supply of granite macadam, setts, kerbstones and sanitary pipes, for the rural district council.—Mr. W. E. Hough, acting clerk, 71, High-street, Runcorn.

SHEERNESS.—April 16th.—For the supply of 300 yards of Leicester granite, 300 yards of clean hoggin, 200 yards of clean sharp sand, and 200 yards of Kent ragstone, for the urban district council.—Mr. V. H. Stallon, clerk, Council Offices, Sheerness.

BELCHAMP.—April 16th.—For the supply of broken granite and slag, for the rural district council.—Mr. S. Allpress, surveyor, Sudbury, Suffolk.

TENTERDEN.—April 23rd.—For the supply of granite or other approved macadam, Kent ragstone, stone-breaking, and tar painting, for the corporation.—Mr. W. L. C. Turner, borough surveyor, Tenterden, Kent.

Sanitary.

GRIMSBY.—April 16th.—For the construction of about 100 yards of 9-in. drain, with manholes, for the rural district council.—Mr. A. Hobson, surveyor, Council Offices, Grimsby.

Stores.

KIRKCALDY.—April 16th.—For the supply of cement, salt, general cartage, hardware and ironmongery, iron castings, sea sand and timber, for the corporation.—Mr. O. F. Frances, burgh electrical engineer, Kirkcaldy.

Municipal Debt.—In reply to a question in the House of Commons, Mr. Hayes Fisher, Parliamentary Secretary to the Local Government Board, stated that on March 31, 1915, the total amount of the outstanding loans of the councils of cities and boroughs in England and Wales, including the City of London and other Metropolitan boroughs, was £281,390,000. Their gross expenditure during the year ending on that date amounted to £71,489,000, excluding expenditure defrayed out of loans.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

KIVETON PARK.—Accepted for the supply of broken slag, granite, and tar-macadam, for the rural district council.—Mr. F. Hewitt, surveyor, council offices, Kiveton Park Station, near Sheffield.
Newton Chambers & Co., Sheffield, tar-macadam, 13s. 1d.
E. S. Whitworth & Co., Sheffield, hand-broken slag, 7s. 1d.
Contract and Works Supply Company, Grimsby, tar-macadam, 7s. 6d.
Berwyn Granite Company, Llangnog, granite, 13s. 6d.
Monkhouse & Peart, Wearhead, whinstone, 14s. 9d.
Whitwick Granite Company, Leicester, granite, 14s. 4d.
Sheepbridge Coal and Iron Company, Chesterfield, slag, 5s. 7d.
J. Carr & Co., Dronfield, slag and tarmac, 5s. 9d. slag, and 13s. 8d. tarmac.
T. Feather, Mirfield, slag, 5s. 5d.

LOUGHTON.—For the supply of 500 tons of granite, 300 yds. of gravel, 200 yds. of hoggin, 150 tons of granite chippings, and hire of steam roller, for the urban district council.—Mr. H. White, surveyor, Loughton, Essex.

GRANITE.

	£	s.	d.
British Macadams, London, E.C. 4	1	1	11
C. Abell, Hartshill Granite Quarries	0	15	0

GRANITE CHIPS.

C. Abell, Hartshill Granite Quarries	0	12	5
H. L. Cooper, London, E.C.	0	13	3
Brookes, Limited, Westminster, S.W.	0	19	3

GRAVEL.

W. & C. French, Essex	0	9	0
W. Skipp, Hertfordshire	0	6	3

HOGGIN.

W. & C. French, Essex	0	9	0
W. Skipp, Hertfordshire	0	6	3

STEAM ROLLING.

G. J. Anderson, Poplar, E., roller, 35s. per day; scarifying, 1½d. per yard; standing, 17s. 6d. per day.
J. J. Prior, Limehouse, E., roller, 30s. per day; scarifying, 1d. per yard; standing, 12s. 6d. per day.
W. G. Smoothy, Essex*, roller, 25s. 6d. per day; scarifying, ½d. per yard; standing, 7s. per day.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

APRIL.

16.—Surveyors' Institution: Mr. J. G. Head on "The Effect of War Conditions on Urban Property." 5 p.m.
17.—Institution of Civil Engineers: Annual General Meeting of Corporate Members. 5.30 p.m.
18.—Institution of Municipal Engineers: Eastern and North-Eastern District Meeting at Peterborough.
20.—Institution of Mechanical Engineers: Mr. Michael Longridge delivers his presidential address. 6 p.m.
20.—Town Planning Institute: Mr. Rees Jeffreys on "Road Construction and Improvements by Means of Town Planning Schemes."
27.—Institution of Municipal and County Engineers: Metropolitan District Meeting. 92 Victoria-street, S.W. 6.30 p.m.

MAY.

2.—Institution of Civil Engineers: Sir James Wolfe Barry on "The Standardisation of Engineering Materials and its Influence on the Trade and Prosperity of the Country" ("James Forrest" Lecture). 5.30 p.m.
8.—Royal Sanitary Institute: Mr. C. H. Cooper, borough engineer and surveyor of Wimbledon, on "Refuse Collection and Disposal." 6 p.m.
17.—Institution of Electrical Engineers: Annual General Meeting. Institution of Civil Engineers, Great George-street, Westminster.

JUNE.

6.—Institution of Municipal Engineers: General Meeting in London. Mr. Reginald Brown, M.INST.C.E., on "House Refuse: Its Calorific Value and its Possibilities." 6.30 p.m.
21-22.—Incorporated Municipal Electrical Association: Annual Meeting. Institution of Civil Engineers, Great George-street, S.W.

APPOINTMENTS OPEN.

COUNTY OF WEST SUFFOLK.

Applications are invited for the appointment of a General Assistant in the County Surveyor's Department for the duration of the war, and must be ineligible for military service. Candidates must be thoroughly experienced in road construction, the keeping of accounts and office routine, and preference will be given to those who are good draughtsmen and have a knowledge of bridge construction.

Applications in the candidate's own handwriting, setting forth experience, qualifications, &c., with copies of three recent testimonials, and stating salary required, to be received not later than Tuesday, 24th instant.

T. W. MORGAN,
Acting County Surveyor.

County Surveyor's Office,
Shire Hall,
Bury St. Edmunds.
10th April, 1917. (3,381)

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Australian Water Supplies.

Two papers, dealing respectively with the Coolgardie water supply and with water supply in the interior of Western Australia, which were read at the last meeting of the Institution of Civil Engineers, and of which abstracts were given in our issue of last week, certainly are of a most valuable character. The authors, Mr. Percy Vincent O'Brien and Mr. John Parr, tell us of the recent trouble in connection with the Coolgardie works in a manner which forms interesting reading following what we have already heard on the same subject. The corrosion of the pipes in this main, having a length of over 350 miles, has given great trouble in the past, neither does it appear that the measures taken to prevent this corrosion have been successful. On the other hand, it is sufficiently clear that the advice of scientific advisers has not been carried out in its entirety, and it is quite probable that those concerned financially have themselves to thank for many of the troubles and consequent expenses experienced. In the first place it is evident that this main was badly coated, and that the coating has been practically useless. The experts who reported in the year 1909 advised de-aeration of the water in order to remove corrosive gases, and now, after eight years, it is at last proposed to adopt this obvious measure of protection. But what has happened in the meantime? In the year 1909 the cost of maintenance was £15,329, while in the year 1915 this had risen to £51,078, and the leakage now appears to be about 1,600 gallons per mile per day, in spite of constant attention. That the leakage is due to external as well as to internal corrosion is also an important fact; so much is this the case that it has been found to be necessary to uncover the pipes because the external pitting can be cured in this way. This pitting occurs in loamy and clayey soils, but not in sand, and there is very little external corrosion in the ironstone ground. The largest of these holes are from 2 in. to 3 in. diameter, and from ½ in. to ¾ in. in depth. The internal corrosion is apparently due to the defective coating in the first place and to the galvanic action set up by the mill scale on the pipe and the adjoining steel in presence of the water. The corrosive gases, viz., oxygen and carbonic acid gas, present in the water naturally expedite the process. The whole story appears to illustrate the fact that the construction of an aqueduct of this character is a matter deserving of the closest co-operation of the chemist and engineer. It is only reasonable to suppose that a coating could have been procured in the first instance which would have remained in place under the special conditions, and which would not have cracked and fallen away. An examination of the earth in which a main is to be laid is also a matter of definite importance, for it is abundantly clear that if it had been known that the surrounding earth would lead to corrosion this trouble at any rate could have been prevented. Similarly, if the water had been treated, it seems reasonable to suppose that the interior corrosion would have been prevented.

In his paper on the water supply in the interior of Western Australia, Mr. O'Brien tells us, among many other matters of great interest, of the difficulties encountered in providing reservoirs for storage. Such reservoirs formed with an earth bank and excavated floor, and lined with puddled clay, were found to lose a great deal of water by absorption, and for this and other reasons they are considered unsatisfactory. In a climate where there are prolonged periods of drought it will be seen that the difficulty of covering and protecting the exposed banks of an empty reservoir would be very great. Concrete-lined reservoirs were also found to be unsatisfactory, owing to the cracks produced by the great changes of temperature. It is most interesting to note that the simple asphalt-lined tank has been found to be quite successful under these trying conditions. Asphalt, 1½ in. thick, spread in two layers, rests upon the solid excavated ground or against the made earth banks with 2 to 1 slopes. The asphalt lining will bend without cracking if settlement occurs, and is uninjured by exposure during a dry season when the reservoir is empty. This method has been adopted for the last fourteen years with excellent results. The author gives a detailed description of the composition and of the process of laying the asphalt, and the paper is clearly illustrated by diagrams. The value of this information should be great to other engineers similarly situated.

* * *

Housing after the War.

During the Easter holiday a most important housing conference was held at Oxford under the auspices of the National Housing and Town Planning Council. The primary object in view was to formulate the general lines of a national housing policy with a view to meeting the situation that will have to be faced immediately upon the conclusion of the war. The acuteness of the need that will exist needs no emphasis, and, happily, evidence is not wanting that the Government are alive to the situation. For example, the council—a well-informed body—suggested to the conference that, in discussing the subject, the provision of the necessary capital to finance housing schemes might be taken for granted, on the ground that in both rural and urban districts the conditions of housing shortage would at the close of the war be such as to render it imperative that the State should place at the disposal of local authorities and other agencies large capital sums on special terms for the purpose of carrying schemes into effect. Then the suggestion was made that the loans to be made available should be used not only by local authorities for the execution of

municipal housing schemes, but also by public utility societies and by local authorities for the acquisition of sites with a view to the leasing of plots to builders and others. In order that the Government may be in a position to make an equitable distribution of whatever funds may be available, the conference resolved that it is desirable that inquiries should at once be instituted as to the precise conditions at present existing in every local government area, both urban and rural, and particularly as to the estimated number of houses that should be built (1) in the first year following the war to meet the more pressing needs, and (2) in the five following years to secure the adequate development of the district. Another question which was under consideration by the conference was that of standard designs. The scheme recommended was that the country should be divided into fifteen districts, for each of which several classes of design should be secured by open competition, the judging being done by a representative committee of experts, to include for each district a member appointed by the Institution of Municipal and County Engineers.

Several very important suggestions were made as to legislative reform, which, including those in favour of a measure of compulsory town planning, were generally on the right lines. We have a little doubt, however, as to the practicability or desirability of the proposal that the powers already possessed by the Local Government Board under sec. 10 of the Act of 1909 should be further amended to enable the board, without any formal complaint being made, and without any local inquiry being held, to call upon local authorities to prepare and carry into effect housing schemes in areas which, in the opinion of the board, are greatly in need of additional housing accommodation. The local inquiry is the principal means now at the disposal of the board for obtaining accurate information as to local conditions and needs. It may be that the formal inquiry could be dispensed with, but there should at least remain a thorough local investigation by a properly qualified inspector if the interests of all concerned are to be safeguarded. Not the least important result of the conference was the adoption of a number of practical suggestions designed to meet the after-war demand for building materials, and it is to be hoped that every effort will be made to induce the Government to act on these and other proposals made by the conference.

* * *

The Influence of Roads in Macedonia.

Reflections in philosophical mood upon roads and road making and the true inwardness of both in their influence upon civilisation are originated in a very readable article which appeared in the *Manchester Guardian* recently, giving the writer's experience as a roadmaker in Macedonia—unexpert, but useful from the military point of view, nevertheless. The soldiers had been put to road building upon the "strangest road the writer had ever seen." On some portions of it its owner had persuaded himself to cut a ditch along each side of it, and to form the surface so that it sloped gently from the centre to the sides, but that was all. Probably more urgent duties interfered with the continuation of the task. "The next thing to be done," says the author, "was to put stone on the prepared surface—first a neat pavement of big stones, and then a layer of stones broken small." The writer, as a peg upon which to append a few reflections, takes one of the "remembered roads of Kent," one of those roads which seem to call the world to the Romans and beyond. "He thought of the Kentish road-men, of the work they did, and the roads which they served; he thought also" how the life of our land drew towards those roads in very remote days, clustered and took shape around them, how they planned and formed our dwelling. I paused to think of this chaotic land (Macedonia) in which I was working. The contrast is complete." For one thing, the Macedonian does not take kindly to good roads, even when they are made for him. He goes barefoot or very lightly shod, and does not care for walking on a hard surface, but chooses by the side of the road a simple track of beaten earth, preferring it to the hard drained surface provided by the labour of the British Tommy. There is a picture of the potent fertility of the soil, of a land which might be the home of a happy and prosperous people, and as the writer hammered away at the stones he dreamed of how even that bit of road might become a power to shape order out of chaos, to draw an unharnessed land into comeliness of life. These British-made roads, says the writer, will give Macedonia a chance, but will the chance be taken? Will they be used, tended, maintained, or will they be left to the destruction of storm and flood? Will the country decide for life, or continue in this appearance of death? The answer, of course, is not yet. There is hope, however. "The old Romans flung their roads through England and shaped the history of a nation, not because they had any vision of what they did, but because it was an order. So we in our time are making a way through this (Macedonian) wilderness, doing things whose consequences may be immeasurable, not for the sake of those consequences, but because it is an order."

* * *

Food Economy and National Service.

The appointment of Mr. Hugh P. Raikes, of the well-known firm of Willcox & Raikes, of Birmingham, as Chief Agricultural Commissioner for England and Wales in the Department of the Director of National Service is one which will naturally interest engineers. The new organisation which has been placed under the control of Mr. Raikes has as its immediate task the supply of civilian volunteer labour for agriculture to meet the demand that will be made by the War Agricultural Committees. For this purpose the country has been divided into eleven districts, each of which is to be placed in charge of a paid commissioner, who will receive the assistance of a number of unpaid sub-commissioners. The latter will work in districts of which they have personal local knowledge; and in this connection it is hoped that it may be found possible to enlist the active interest of local authorities and their officials. The vital importance of the work can hardly be over-estimated, and we are confident that if another call is to be made on the patriotism of municipal officers in connection with this new national effort, it will provoke a response limited only by the possibilities of the case, having regard to depleted staffs and existing tasks connected with the national emergency. It does not require much reading between the lines of reports of recent speeches of Mr. Kennedy Jones, the Director of Food Economy, to see that a real food crisis—that is, a bread crisis—in the very near future can only be avoided by a supreme and united national effort in two directions. First, every possible acre of land must be put under wheat without delay; and, secondly, there must be an immediate reduction in the consumption of breadstuffs. The first is a matter closely connected with the task which has been undertaken by Mr. Raikes; while the second is an object that can only be achieved by the conscientious co-operation of every individual. So convinced are we of the absolute necessity for this economy in the use of bread, that we feel it to be our duty to urge our readers not only to make every effort to effect a reduction in the consump-

tion of themselves and their families, but also, as opportunity may occur, to use their influence as public officials in the same direction. To put the matter in a nutshell, if every person will eat one pound of bread less each week, we can laugh at the submarine in so far as it affects the question of food supply. This reduction in bread consumption is far more urgent than any question of meat, sugar, or potatoes, and we feel sure that once this is realised by the general public the necessary sacrifices will be willingly made and cheerfully borne.

* * *

The Humorous Side of Sewage Disposal.

An element of gaiety was added to a recent meeting of the New Hampshire Board of Health by a letter from an irate citizen, evidently a French-Canadian, who had become possessed of the idea that a house sewage disposal tank recommended by the board would produce a good drinking water. The letter was originally sent to the local health officer, who, in giving instructions to the aggrieved one as to the building of the tank, had said that the effluent would be as clear as ordinary brook water. The missive ran as follows:—

I write to tell you dat the box built by Louis La Flam to make water from Priva as good as new is not worth one dam. He build box just as you say plug up tight with out hole only one end and run pipe to my barn for cow and horse which wond drink water I dont know why, but think it no good so I try it. I dont feel much good two three day my man Joe Bodro try it he puke all over place have Dr. You send me $25 all right if not I give you dam licking some time.

(signed) LOUIS LA FLAM.

By way of further explanation it may be noted that there appeared in the New Hampshire *Bulletin of Sanitation* an article showing how a cesspool can be remodelled so as to provide free discharge that gives no offence. Several hundred watertight, free-flowing sewage tanks have been built in New Hampshire for household use, and these have successfully accomplished their purpose in producing an effluent that is as clear as ordinary pond water, and practically odourless. Mr. Robert Fletcher, the president of the New Hampshire Board of Health, has samples of effluent from such tanks, at least one of which is more than two years old, and all of which have remained practically clear and have developed no unpleasant odour; but he has now issued the very necessary warning that this effluent is still sewage, and must not be allowed to reach any source of water supply.

* * *

Unexpended Grants.

At the last meeting of the Cornwall Main Roads Committee the county surveyor, Mr. Thompson, reported that from the quarterly returns under the main road contracts he found a few instances where the amounts expended to December 31st would appear to indicate that the contract for the year 1916-17 would be considerably underspent. After examination of the final quarter's claim it might, he added, be necessary for him to withhold certain payments, or, at all events, to obtain guarantees, as far as possible, in order that any amounts so underspent should be taken into account in connection with the work of maintenance during the financial year 1917-18. Commenting on the report, the chairman said there was no doubt, because of the difficulty of procuring labour and material, that the roads were not maintained in their normal state. Grants had been made to certain urban councils, which had been unable to spend all the money allotted them. It would be wise for the committee to consider whether in cases of that kind it would be possible for the different authorities to hold the unspent money in a suspense account to their credit. That money would then be available when labour and material were obtainable. They did not want anybody in these times to spend money for the sake of doing so, and they did not wish to penalise authorities which had been sagacious enough to economise. They ought not to put a premium on wasteful expenditure by saying, "If you don't spend it this quarter, you shall not have it at all." That money ought to be put aside to be spent in bringing the roads back to normal conditions at some future time. It is quite certain that unless county councils realise the necessity for this, and act accordingly, they will be obliged in the future to vote some exceptionally heavy amounts for the repair of the roads; and that the Cornwall authorities are determined not to be placed in this difficulty is evident from the committee's decision to recommend that the amount of the grants not expended should be placed to the credit of the councils concerned.

* * *

Road Making under Difficulties.

The brief paper which was read by Mr. A. W. Broker, the surveyor to the North Witchford Rural District Council, at the meeting of the Institution of Municipal Engineers at Peterborough on Wednesday was of exceptional interest. In it he described some of the extraordinary difficulties which confront the highway engineer in the low-lying districts of the Fens, where, in ordinary circumstances, the formation of a proper foundation is impossible, owing to the presence on the surface of a thick layer of peat and black soil. As Mr. Broker pointed out, the problems of road construction and maintenance are not unconnected with those of the production and distribution of foodstuffs, and it would be a distinct advantage if this simple fact were more generally realised. Experience has shown that for roads over boggy ground local chalk is the most suitable material for a foundation. It can be obtained in large lumps, sets very firmly with proper consolidation, resists the natural dampness of the soil, and holds in the hard materials used for surfacing. Even with this foundation, however, it is extremely difficult to make a road which is thoroughly satisfactory even for light traffic, while if heavy traffic has to be provided for very special precautions must be taken. For example, the military authorities have recently made a road in the following manner: First, two layers of rocky chalk were placed on the Fen soil and thoroughly rolled, the first being 6 in. and the second 12 in. in depth. Upon this a raft was formed of reinforced concrete, cambered to a proper shape, and provided with a raised margin on each side to receive a surface of tar-macadam. The result has been satisfactory so far, but, of course the cost of this kind of construction is such as to prohibit its adoption in normal circumstances.

* * *

Greater London's Dustbins.

It is to be hoped that members of the Institution of Municipal and County Engineers will take full advantage of the invitation which has been extended to them by the Metropolitan District Executive to attend the forthcoming meeting at which Mr. Reginald Brown, M.Inst.C.E., the engineer and surveyor to the Southall-Norwood Urban District Council, will present a paper dealing with the important problems connected with the dustbins of Greater London. Mr. Brown will bring forward a number of suggestions—which, if we know him at all, are likely to be of an eminently practical character—for the solution of these problems, and the proceedings should prove of the very greatest interest to those who are able to be present. The meeting, it may be noted, will take place on Friday next, the 27th inst., at the Institution offices, 92 Victoria Street, Westminster, and will commence at 6.30 p.m.

Experiences in a Fen Rural District.*

By ARTHUR W. BROKER, Surveyor to the North Witchford Rural District Council.

As there are comparatively few in the profession who have really a Fen district to deal with, it occurred to me that at one of our meetings, on hearing of the various difficulties encountered by our brothers in the profession in maintaining their roads under present conditions, that it might be of interest to those who are unacquainted with the Fens to hear what we have to contend with in such districts. In the first place, that which all engineers begin with, "foundation," in quite three-fourths of the mileage of the Fen roads is non-existent, because it is absolutely impossible to think of removing the peat and black soil of which the Fens consist down to the clay subsoil. Some of the older main roads were, of course, formed on the higher parts that run through the Fens, because at that time the Fens were undrained and were mostly under water. In speaking of clay subsoil, I ought to mention here that on several of the higher parts a very fine bed of gravel is frequently found, and it is with this material only that the majority of the roads were first formed in this locality; in fact, it was not until quite recent years that anything else was thought of.

"ROADS LIKE INDIARUBBER."

Now, to start a foundation for a road with the material mentioned, and considering 50 per cent of it to be sand, laid approximately at 12 in. depth, it must be apparent to all that the surveyor will have trouble for many years; but when one comes to realise that this thin layer of gravel has been laid on the peat soil, which may vary from 1 ft. to 10 ft. or 12 ft., before anything of a solid nature is found, one will probably understand some of the difficulties encountered in the Fens. Every vehicle (even those of light load) that passes over these roads makes them vibrate, and it is simply like a piece of india-rubber giving way under the weight and springing up again after the wheel has passed over, leaving the surface cracked and the stones loose, which latter the horses very soon kick out if the surveyor neglects to apply a dressing of some fine material.

I remember some four or five years back one of our great engineers was consulted as to the best course to adopt in dealing with a case such as I have described, and he recommended removing the peat and soil from under the road. Now to do that on an extensive scale is almost (only almost) impossible, unless you have something like the recent War Loan to work with, which is not the usual state of local authorities, especially in the Fens.

I have had the privilege during the last two years of putting down an experimental section of new Fen road on several occasions. I say experimental advisedly, because it must remain as such for the reason mentioned above, only in this case the military authorities asked for it. The Road Board were the promoters, the length being about ¼ mile, and the method adopted was to put two layers of a very good rocky chalk on the Fen soil, the first one 6 in. in depth, and well rolled with horse-roller, and the second 12 in. in depth and also well rolled as before. On the way through a private enclosure path connected to a public road was built, with a raised margin on each side to prevent the vehicular traffic. The whole thing cost only about £2 4s. 6d. in depth and looked very fine, but the agricultural land through which it passes would not be worth the money the road has cost, and it would therefore be quite out of the question in the ordinary way. The latter through which this piece of new road passes is very low, and I should imagine at times of flood is from 12 ft. to 16 ft. below the level of the water in the river, which is only held out by the banks of earth, and these are very serious, and at times break and flood the district. It may not be generally known, but to reach Peterborough and Ely, which is practically all flat country, the waters from the higher parts of Cambridgeshire, Huntingdon, Bedford, and Northampton pass on. At times there is a great deal of misery with those who live in the low parts. In mentioning the low parts, I have before me an Ordnance Datum of 14, and the highest that I find is 25 ft. The only one here is a hill.

DRAINAGE PROBLEMS.

Now, to prevent these lowlands from being under water, artificial means of lifting have to be used, and for that purpose the Fens were laid out in districts and artificial rivers with high banks formed. Then come the smaller and local drainage districts, varying from 1,000 to 12,000 acres in extent, the commissioners of which are responsible for the efficient drainage of the lands, without which they would be useless for cultivation. Never before in the history of our country has agriculture been so much to the fore (and more especially in the Fens) as now, when everyone is anxiously watching the food problem, and it is in the Fens that the most abundant crops of potatoes are grown. Perhaps it may be questioned what has that to do with the rural surveyor, but I contend that it is, or should be, the first consideration of the official to do all in his power in order to facilitate the production and delivery of food stuffs, to open up new roads, and get those metalled which are unmetalled, at such first costs as are within the reach of those who have to bear them (the owners of property).

In the particular district in which I am interested there is a method of raising money to make new roads, opening up agricultural land, which does not exist, as far as I know, in any other part of the country, and is quite outside the Highway Acts, the Private Streets Acts, &c. One of the large drainage levels has power to give permission to the smaller internal drainage districts to raise money on loan to defray the initial costs, which can be spread over a period of thirty years, payable by the particular lands benefited: In several instances with which I have had dealings this works out at about 3s. 6d. per acre per annum for the thirty years, and has proved a great benefit to the districts where applied.

With the remarks that I have made respecting drainage it will be seen how much we are depending upon other authorities for drainage, even with roads formed on the Fen soil, and I think I have made clear how impossible it is to remove the weak soil and still be above water levels. The question then is what is best to meet the limited funds at one's disposal, and at the same time to provide a road equal to the traffic of the district.

FOUNDATION MATERIALS.

In my experience over about twenty years I have used the local gravels, brick-bats, and chalk to form the foundations for local roads, and, of course, before one can definitely say which is the most satisfactory to use the circumstances of the case have to be taken into consideration: first, the soil on which the road is to be formed; and, secondly, the facilities for obtaining the bulk of the material required, as freightage is a very large item of the expense.

If the road is near a navigable river, and it is to be formed on the bog, no doubt chalk, such as is found between Cambridge and Ely, on the River Cam, and near by, in Suffolk, is the very best material to use. It can be obtained in large lumps, and after being well consolidated, will set very firm, and, what is most important, will resist the wet and hold in the hard materials used for surfacing; and if by any chance cracked with excessive weight will very soon reset, especially after a rain.

The last section that it was my privilege to undertake was in the memorable July and August of 1914. This was made on one of the worst bogs I have ever met with, almost like a sponge, but chalk was used, and the road has given satisfaction to all concerned.

In these few remarks I have endeavoured to show under what conditions surveyors work in the rural Fen districts in the management of roads, and I trust that what I have said will have been of interest, and will prove of use to those who may be similarly situated to myself.

The Supply of Road Materials.—At the last meeting of the council of the Institution of Municipal and County Engineers, the Roads and Tramways Committee brought forward a proposal that the attention of the Local Government Board should be drawn to the necessity of obtaining material for the maintenance of roads with a view to some alteration in the classification of quarrying as a non-essential trade.

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* Paper read at the Eastern and North-Eastern District meeting of the Institution of Municipal Engineers held at Peterborough on Wednesday.

A National Housing Policy.

PROPOSALS OF AN OXFORD CONFERENCE OF EXPERTS.

Recent utterances of the Prime Minister on the subject, and the statement that the Local Government Board are engaged in the preparation of a new scheme, have made it clear that the important question of the housing of the wage-earning classes is having the close attention of the Government. Prominent among the various organisations which have directed their efforts towards a solution of this now pressing problem is the National Housing and Town Planning Council, and a conference of some forty experts which met under its auspices at Oxford at Easter have put forward a number of proposals which are likely to prove of considerable assistance to those responsible for the formulation of a national housing policy.

In a note issued by the council respecting the scope of the conference, it was suggested that in discussing the subject the provision of the necessary capital to finance housing schemes might be taken for granted, on the ground that in both rural and urban districts the conditions of housing shortage would at the close of the war be such as to render it imperative that the State should place at the disposal of local authorities and other agencies large capital sums on special terms for the purpose of carrying housing schemes into effect in the period immediately following.

With regard to the question as to what agencies should be called on to use the loans thus granted, it would seem to be clear that we must rely on:—

(1) Action by local authorities in carrying into effect municipal housing schemes.

(2) Action by public utility societies.

(3) Action by local authorities in acquiring estates and leasing plots (after making the roads and planning the land in accordance with good town planning standards) to public utility societies and to private builders at the lowest possible rentals, and under conditions which shall secure the development of such estates on the best modern lines.

It was probable that action in regard to (1) would be general throughout those districts in which the housing shortage had been acute for the past twenty years—*e.g.*, in mining districts, such as those of Durham and Northumberland and Lancashire, and in rural areas. In such urban and mining districts private enterprise had failed to meet the need for nearly a quarter of a century, and in rural districts for nearly half a century. It was clear therefore that in these districts, if action was to be taken at all, we must rely largely upon municipal housing action.

In regard to (2) there would seem to be a valuable field for the efforts of public utility societies, subject to certain alterations being made in the law and in the procedure laid down by the Public Works Loan Commissioners. But unless the two-thirds proportion was increased it would be impossible for most public utility societies to take up housing work. The interest they might pay was limited to 5 per cent under the Act of 1909, and as the security was only that of a second mortgage, it was clear that the difficulty of finding the last third of the capital would be so great as to be almost insuperable.

In regard to (3) an enormous field of useful work might be opened up by the modification and amendment of existing housing legislation. The subject was referred to in the following paragraph taken from the report of the Special Housing Enquiry Committee of the Birmingham City Council:—

"The committee has been forced to the conclusion that a resumption of building in the suburbs is a necessary preliminary to more drastic measures in the centre. After consideration of various alternatives, the committee consider the best way of aiding the resumption is for the council to purchase estates in the undeveloped areas, and, after developing them by constructing roads, laying sewers and mains, and providing easy access, to let off the building plots to public utility societies and builders, imposing suitable restrictions on ground rents."

To this it might be added, the note proceeded, that if the Small Dwellings Acquisition Act were amended and extended before the close of the war, an enormous stimulus could be given to the movement in favour of the acquisition by workmen of the homes in which they live. Certain provisions must, however, be made to secure that the money advanced by the State shall be devoted to this end, and provided that the estates are properly planned by local authorities, a housing policy which would be fully welcomed by the advocates of private enterprise in house supply could be embarked on with great benefit to the whole community.

The conclusions of the conference are summarised in the following series of proposals:—

FINANCE.

That (*a*) in view of the need for carrying into effect immediately after the war the rural housing policy urged by the Agricultural Sub-Committee of the Reconstruction Committee, and (*b*) in view of the equally urgent need for dealing with the colossal urban housing shortage by providing that the housing problem in towns shall be dealt with in the spirit which animated Mr. Walter Long when he received the housing and town planning deputation in September last, the Government should announce that at the close of the war housing loans and grants in aid will be available for use by local authorities and other agencies (these agencies to be defined by the Government).

The Government should make clear the fact that, although the special terms on which these loans will be available cannot be clearly defined before the close of the war, the difficulties which will be experienced, both in regard to the rate of interest of capital and the cost of building materials, will be taken into account, and grants-in-aid given for approved schemes.

PRELIMINARY INQUIRIES.

The Government should call on all city, county borough, town, rural and urban district councils in England and Wales, and on burghs and county committees in Scotland, to prepare and submit, within a period of three months, returns setting out the following details:—

(*a*) The number of houses unfit for human habitation in their district.

(*b*) The number of houses not in all respects reasonably fit for human habitation.

(*c*) The extent to which existing working-class houses are overcrowded.

(*d*) The number of unlet habitable dwellings at less than a certain rent.

(*e*) The estimated number of houses which should be built (1) in the first year following the war to meet the more pressing needs, (2) in the five following years to secure the adequate development of the district.

(*f*) The prospects of the needs described in (*e*), (1) and (2) being met by the operation of private enterprise.

The making of these returns should be made a statutory duty, and in view of the depletion of the staffs of local authorities and the expense involved in securing aid in the work of preparation, a grant should be given by the Government to local authorities of 3d. per house coming within the category of the inquiry. The cost on this basis will be less than £100,000, and the returns will give the Government a fair basis on which to base their housing proposals.

DESIGNS FOR DWELLINGS.

Certain standards as to component parts should be arrived at, and with these, and with certain general by-laws applicable (*a*) to rural districts, (*b*) to industrial villages, and (*c*) to towns, as the basis, the Government should devote £150,000 to securing new designs and plans for dwellings suitable to, say, fifteen separate districts of England and Wales and Scotland, £10,000 to be allocated to each district.

The districts may be thus defined:—

(1) Devon, Cornwall, Somerset, and South Gloucestershire.

(2) South Wales and Monmouthshire.

(3) North Gloucestershire, Warwickshire, Staffordshire and Worcestershire.

(4) Herefordshire, Shropshire, Mid-Wales and North Wales.

(5) Lancashire, Cheshire, North-West Derbyshire, Westmoreland and Cumberland.

(6, 7 and 8) Three Scottish districts. (At the next meeting of the Scottish Committee of the National Housing and Town Planning Council suggestions

relative to the delimitation of these Scottish districts will be framed and submitted to the Government.)

(9) The North-East Coast—Durham, Northumberland and Tees Side.

(10) The three Ridings of Yorkshire, North Lincolnshire, and North-East Derbyshire.

(11) South Lincolnshire, Nottinghamshire, South Derbyshire, Leicestershire, Northamptonshire, and Rutland.

(12) Norfolk, Suffolk, Cambridgeshire and Huntingdonshire.

(13) Northern Home Counties outside Greater London—Berkshire, Oxfordshire, Bedfordshire, Buckinghamshire, Hertfordshire, Essex and Middlesex.

(14) Southern Home Counties outside Greater London—Kent, Surrey, Sussex, Hampshire, Wiltshire and Dorsetshire.

(15) Greater London, including London County.

For each of these districts several classes of designs should be secured, and it is suggested that three designs should receive awards in each class.

The following definite classes and types would seem to be necessary in England and Wales. (The Scottish classes and types will be defined by the Scottish Committee of the National Housing and Town Planning Council at their next meeting).

Rural Villages.

(1) Smallholder's cottage, with three bedrooms, living-room, scullery, and outhouse.

(2) Smallholder's cottage, with three bedrooms, living-room, parlour, scullery, and outhouse.

(3) Semi-detached labourer's cottage, with three bedrooms, living-room, scullery, and outhouse.

(4) Semi-detached labourer's cottage, with three bedrooms, living-room, parlour, scullery, and outhouse.

(5) Cottage, in row, with three bedrooms, living-room, scullery, and outhouse.

(6) Cottage, in row, with three bedrooms, living-room, parlour, scullery, and outhouse.

(7) Block plans, showing method for grouping cottages.

Industrial Villages (Including Mining Villages).

(1) Semi-detached cottage, with three bedrooms, living-room, and scullery.

(2) Semi-detached cottage, with three bedrooms, living-room, parlour, and scullery.

(3) Block of cottages, each with three bedrooms, living-room, and scullery.

(4) Block of cottages, with three bedrooms, living-room, parlour, and scullery.

(5) Single cottage for family, a member of which suffers from tuberculosis.

(6) Block plans, showing method of grouping cottages.

Towns.

(1) Semi-detached cottage, with three bedrooms, living-room, and scullery.

(2) Semi-detached cottage, with three bedrooms, living-room, parlour, and scullery.

(3) Block of cottages, each with three bedrooms, living-room, and scullery.

(4) Block of cottages, with three bedrooms, living-room, parlour, and scullery.

(5) Single cottage for family, a member of which suffers from tuberculosis.

(6) Block plans, showing method of grouping cottages.

Provision should be made, whether in rural or urban districts, for a bath to be fitted, but not necessarily in a separate bath-room.

It is suggested that these designs shall be selected for each district by committees nominated by the Government and made up as follows:—

Representatives of local authorities, each of the following organisations appointing one: Association of Municipal Corporations, County Councils Association, Urban District Councils Association, Rural District Councils Association, Institution of Municipal and County Engineers, and the Society of Medical Officers of Health.

Three representative architects.

One representative of the Federation of Building Trades Employers.

One representative of the National Building Trades Council.

One lady appointed by the National Union of Women Workers.

Two representatives of the Parliamentary Committee of the Trade Union Congress.

Each committee to be resident in the district concerned.

An adequate amount should be paid for each design selected, say £200, and the designs should then become the property of the Government and be available for use without royalty.

The Government should urge local authorities who have not their own architects to call in the services of the architect whose plan is chosen as the basis of housing action to assist in the following ways:—

(*a*) To prepare a lay-out of the area of the housing scheme.

(*b*) To plan the site.

(*c*) To deal with questions of aspect and prospect.

(*d*) To prepare the working plans for the builder.

The payment for these services to be 1 per cent of the cost of the scheme.

Local authorities should be urged to obtain options on land without delay in all cases in which the prices asked for such land will render possible the carrying into effect of housing schemes on town-planning lines.

LEGISLATION.

The powers already possessed by the Local Government Board under sec. 10 of the Act of 1909 should be further amended to enable the board, without any formal complaint being made and without any local inquiry being held, to call upon local authorities to prepare and carry into effect housing schemes in areas which, in the opinion of the board, are greatly in need of additional housing accommodation.

Emergency legislation should be enacted, providing that it shall be sufficient for local authorities in the promotion of town planning schemes and in the declaration of an area as the subject of a town plan, by advertisement to call upon the owners and other persons interested to show cause why such area should not be made the subject of a scheme.

Amending legislation should be passed before the close of the war, requiring all local authorities to prepare preliminary town planning schemes for urban areas (or in the case of rural areas, rural planning schemes) providing for (*a*) the limitation of building densities on the unbuilt-on portions of their respective areas, (*b*) the planning of main traffic roads, and (*c*) the fixing of building lines on new and existing roads.

Emergency legislation should be passed requiring those local authorities which have already in hand the preparation of town planning schemes to prepare and pass before the close of the war interim regulations governing such matters as the width and position of roads, all matters covered by sec. 59 (2) of the Housing and Town Planning Act, 1909, and building regulations for those parts of the controlled area which are in process of development while the actual scheme is under preparation.

Where town planning schemes are, at the close of the war, not in preparation by local authorities—that is to say, in those cases in which local authorities have not applied for permission to prepare town planning schemes—the Government should make a condition that in all cases where housing loans are granted plans of the lay-out sites on town planning lines should be submitted to the Local Government Board, and loans should not be granted unless the lay-out of the site is approved by the town planning advisers of the board. Further, that where the Local Government Board permits relaxation of conditions as to road width, where this is not in accordance with the local by-laws, the local authority should be required that, as a condition of the board's sanction being given to such relaxation, an undertaking should be given to prepare a town planning scheme for the area of which the housing area forms a part.

BUILDING MATERIALS.

The following suggestions relate to the cost and supply of building materials at the close of the war:—

Towards the end of the war, when the great Government factories will still be kept "in being," but when the output of shells will be slackened off, the workmen in these factories should be employed where possible in making the fittings needed for after-the-war schemes.

Towards the end of the war, when the general rate of production of munitions of war is slackening off in controlled establishments, a certain number of these shall be employed in the production of fittings for the production of which they are normally equipped.

So far as the materials for working-class homes are concerned, the industries devoted wholly or in part to the production of such building materials should

be controlled by the Government, and in order to set these industries working at full pressure at the earliest possible moment, such industries as those of brick-making, cement-making, and quarrying should be regarded as key industries, and workmen from these industries at present in the Army should be demobilised before workmen in other industries. Further, as the Government will still control the collieries, brick and cement manufacturers should be supplied with coal at the lowest possible prices relative to the cost of production.

Bulk orders for bricks, cement, stone, and building materials generally shall be given, at prices to be determined by the Government, for groups of areas in which housing schemes, both rural and urban, are to be carried into effect.

Wherever possible and practicable, the supply of home-grown timber should be stimulated, and in view of the dependence of this country on foreign countries for the supply of timber, early consideration should be given by the Government to the possibilities of providing special transit facilities for the import of timber from Canada, America, Sweden, the Baltic, and Russia.

The timber and fittings—glass, &c.—of temporary war buildings dismantled at the close of the war should be made available at the lowest possible prices for the housing schemes of local authorities and other agencies.

All future temporary war building work should be carried out with a special view to the use of the materials for housing and other approved buildings at the close of the war.

Special inquiries should be made by the Government in regard to the possibility of using reinforced concrete as a substitute for timber in roof construction, &c.

Some measure of control should be continued by the Government throughout the year following the war in regard to the character of the buildings to be erected. For example, dwellings for the working classes should be given precedence over picture palaces—even though the latter may be more remunerative as investments.

FORESHORE SAND ACCUMULATION.

WORTHING BOROUGH SURVEYOR'S EXPERIMENT.

In connection with the scheme for the collection of sand on the foreshore at Worthing, the borough surveyor, Mr. F. Roberts, reported recently that piles and light breastwork had been constructed in the sand on the foreshore opposite to and 40 ft. from the south end of two groynes, which were lengthened and connected with the east and west ends of the breastwork.

After a few days, and during a stormy easterly wind, a scour was formed on each side of the breastwork, leaving a large pool of water, which caused a drainage in the immediate neighbourhood, resulting in the formation of a considerable area of dry sand south of the breastwork.

Sand did not, however, accumulate between the two groynes and the north of the breastwork as was anticipated. The scour continued to such an extent that the piles of the breastwork were exposed to their foundations, and, being deprived of support, were finally washed out, the greater portion being afterwards recovered.

The experiment, it is pointed out, has only been most useful in showing that dry sand can only be obtained by drainage in some form, and that piles without planking would be more durable, and would form a drainage consisting of a series of pools resulting in dry sand for a considerable area in the immediate vicinity.

Local Loans and Sinking Funds.—The Local Government Board intend to introduce a Bill in Parliament which has an important bearing financially for public authorities all over the country. It is desired by the Department to acquire the power, in cases of proved necessity, to suspend, during the continuance of the war, all contributions to sinking funds and all repayments of loans. Furthermore, it is considering in such cases to grant loans to local authorities, free of interest, during the period of the war. In the last-named circumstances the loans would be liable to carry interest at 1 per cent above bank rate, and a special rate would have to be levied for the repayment of principal and interest.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Now that the shortage of food is becoming a serious menace, and foodstuff for live stock has to be curtailed, would it not be well if increased attention were given to the fertilising value of sewage properly applied to the land? Are there not numerous sewage disposal works in this country with little or no land for cultivation, where perhaps arrangements could be made with adjoining tenants of farms or land by which the sewage could be judiciously used to encourage the growth of rye grass, roots, and other produce? Does it not seem to be a grievous pity that such a valuable manure as sewage should be wasted when there is such an outcry for better and more scientific farming?

. . . .

It is frequently claimed that the roads of Singapore are some of the best in the world, but when we consider the nature of the traffic on them is it a fair comparison to make with other roads which have to bear ordinary traffic? When we find that there are no fewer than 8,849 rickshaws in that city which are propelled, or dragged, by barefooted runners, is it not evident that the wear on the roads must be very light? Do the roads of Singapore carry any heavy-wheeled traffic at all?

. . . .

Who is the Mr. O. T. Godfrey, F.C.A., who, according to the *Canadian Engineer* of March 15th, has been questioning the integrity of "municipal consulting engineers," his suggestion being that they purposely underestimate the cost of proposed works in order to get the ratepayers to sanction the job, and that over-expenditure would not occur in contracts if they did not get a percentage on this over-expenditure? What authority had Mr. Godfrey also for stating that he knew of no case where the estimate for carrying out waterworks or electric lighting came within the original estimate? Was it not to be expected that the *Canadian Engineer*, in referring to this indictment, took up the cudgels for the engineers in no measured terms?

. . . .

Could not the strengthening of the Charing Cross railway bridge be so carried out that the appearance of the structure might be improved, at only a comparatively small extra expense? Now that architects have been foiled in their endeavours to have a new bridge and a great street improvement, can they not direct their energies to giving advice in this connection?

. . . .

Will not the new road chain or caterpillar system which has recently been adopted by Messrs. Clayton & Shuttleworth in connection with motor tractors be a great help to our roads if the system is largely used? Does not this system spread the weight over a large area of the road surface, and, as it has an enormous adhesive force on that surface, does it not become a real self-propelled vehicle without depending on the pull or shear of self-propelled wheels, which is so damaging to our roads? Will it not also render unnecessary the use of spikes or other protuberances on the tyres of wheels?

. . . .

Is it not rather interesting to see in his last annual report that the Governor of the Panama Canal takes great exception to the views of some of the geological experts who were called in to advise as to the slides which have taken place during and since the carrying out of this great engineering work? Is it not also rather amusing to read the conclusion of this part of the report which says: As predicted at the time the great Culebra movements occurred, the slides will be overcome finally and for all time, notwithstanding the calamity howlers and in spite of the disastrous predictions of the "know-it-alls"? What has made the Governor's slander "riz" to such an extent?

Payment of Professional Subscriptions.—Aldershot Urban District Council have agreed to pay the annual subscription to the Institution of Municipal and County Engineers of their surveyor, Mr. F. C. Uren.

Monaghan County Sanatorium.—The Monaghan new county sanatorium was formally opened last week. The building, which was formerly the county fever hospital, contains five wards. All the work was carried out under the supervision of the county surveyor, Mr. J. J. Hannigan.

Wayleaves.*

By C. VERNIER, M.I.E.E.

Some time ago in 1905, when Mr. G. L. Addenbrooke read a paper entitled "The Value of Overhead Mains to Electric Distribution in the United Kingdom," † reference was made to the difficulties which were then being experienced, and which it was anticipated must inevitably be experienced in a greater degree as the use of overhead mains tended to become more general. In this paper some particulars were also given of the favourable legislative provisions afforded for the erection of overhead and underground mains on private property in Italy and Switzerland.

During the twelve years which have since elapsed the need for such facilities has become more and more insistent. Electric power supply, as we know it to-day, was then in its infancy, and although between 1,000 and 2,000 route miles of overhead electric mains‡ have already been erected under the difficult conditions at present obtaining in this country, the time has come to consider seriously whether the important services which public supplies of electrical power, light, and heat must continue to afford—and certainly in a greater measure than ever before—to our industries, manufacturers, railways, and the practically untouched field of agriculture, in the strenuous and difficult times which will follow the present European conflict, do not call for prompt legislative assistance in removing certain difficulties that at present hamper their fullest development.

The need for efficiency and economy will be so seriously accentuated, both in regard to a more efficient utilisation of our seriously depleted capital and also in regard to the conservation of our natural resources, of which in this country coal is unquestionably the most important, that there is every reason to expect that electrical services which can so eminently achieve both these objects will be sought for to an unprecedented extent after the war.

I do not propose to recapitulate the advantages and economies which can be derived from the generation of electrical energy on a large scale, or from the centralisation or linking up of existing electricity supply undertakings. These questions have been already so fully discussed in papers and addresses published within recent years that I may fairly assume that they are now generally recognised. I am all the more readily disposed to adopt this view in that it has received striking confirmation by the formation recently of various committees to give effect to the policy of linking up existing undertakings as suggested by the Board of Trade, as well as to consider the much more ambitious project of a fully national scheme of electric power supply. At the outset let me say that the present paper is more closely concerned with securing to the fullest possible extent the advantage of the economies in capital cost which can be effected by the use of overhead wires for interconnecting, transmitting, and distributing [illegible] open country, and the no less important economies which can be obtained by laying underground mains wholly or partly on private property, wherever the use of such mains is found desirable. My remarks, however, must not necessarily be taken as applying to overhead wires in towns and villages, which stand in a somewhat different category. The economies above referred to [illegible] well emphasised in previous discussions that they need be briefly mentioned here. It will be sufficient to state that on 20,000-volt mains the saving in capital cost which can be effected [illegible] route by the use of overhead wires as against the use of underground cables in the neighbourhood of 50 per cent., excluding the cost of wayleaves in each case. At higher pressures it is yet greater, while by using [illegible] for underground mains, instead of keeping closely to public roads, a saving in [illegible] is not uncommon on routes of several miles, and even more on shorter lengths, by the power to shorten routes and cheapen construction of the ground. It must further be borne in mind that although the Board of Trade are willing to allow extra-high-pressure overhead lines on public roads, subject to strict requirements regarding public safety, practical considerations usually render this, if not quite impracticable, at least extremely undesirable, and therefore all such lines must ordinarily be placed on private property.

We have also to face the probability that in the near future much higher transmission pressures will be employed, and this cannot in the present state of the art be satisfactorily dealt with (if at all) by underground cables. The difficulties already referred to in the use of overhead wires for extra-high-pressure transmission fall conveniently under two heads—viz., "Consents" and "Wayleaves."

CONSENTS.

The Electric Lighting Acts contain the following clauses:

Sec. 14 *Electric Lighting Act*, 1882.

Notwithstanding anything in this Act or in any Act incorporated therewith, the undertakers shall not be authorised to place any electric line above ground, along, over or across any street without the express consent of the local authority, and the local authority may require the undertakers to forthwith remove any electric line placed by them contrary to the provisions of this section; or may themselves remove the same, and recover the expenses of such removal from the undertakers in a summary manner; and where any electric line has been placed above ground by the undertakers in any position, a court of summary jurisdiction upon complaint made, if they are of opinion that such electric line is or is likely to become dangerous to the public safety, may, notwithstanding any such consent as aforesaid, make an order directing and authorising the removal of such electric line by such person and upon such terms as they may think fit.

Sec. 10 (*b*). *Electric Lighting (Clauses) Act*, 1899.

The undertakers shall not, without the express consent of the Board of Trade, and where the local authority are not themselves the undertakers, of the local authority also, place any electric line above ground except within premises in the sole occupation or control of the undertakers, and except so much of any service line as is necessarily so placed for the purpose of supply.

In considering these clauses it is necessary to differentiate between the various classes of undertakings, viz., statutory municipal and statutory company undertakers, and non-statutory undertakers. The above clauses, it will be seen, compel statutory undertakers to obtain the consent of the local authority to the erection of overhead mains everywhere outside their own premises. This consent is obviously unnecessary in the case where a local authority are themselves the undertakers, supplying only within their own district, and such consent in the case of a local authority would only be required in the exceptional case of a municipal undertaking wishing to erect overhead wires for giving a supply outside the area scheduled in the Order and in the district of a neighbouring local authority under powers conferred by Sec. 6 of the Electric Lighting Act, 1909.

For a statutory company undertaking the consent of the local authority is in every case essential, and further, there can be no appeal from the decision of a local authority in this matter, which may refuse its consent without assigning any reason or may attach unreasonable and onerous conditions thereto, or cause unreasonable and vexatious delays. There is only one usual exception to this procedure—*i.e.*, in the case of the Power Acts, where an appeal to the Board of Trade is allowed in the event of a consent by a rural district council being unreasonably withheld.

The anomaly of the position will be better appreciated when it is pointed out that any private individual or company who care to undertake the transmission or distribution of electricity without statutory powers which can be and is commonly done, for example, by colliery and quarry owners and others, as there is no restriction placed upon it so long as electricity supply to consumers is not the chief business of the undertaker* is perfectly free

* Being a paper read on the 13th inst. at a meeting of the [illegible] Electrical Engineer.

† Journal I.E.E., Vol. 34, p. 541.

‡ Not necessarily all on private property.

* Electric Lighting Act, 1909, sec. 23.

to erect overhead wires over private land without the consent of the local authority, and can quite well carry such wires across public roads and footpaths, provided the local authority are not the owners of the land on either side of the road and that care is taken not to contravene any by-laws which the local authority may have adopted, and further, in the absence of special by-laws, that the highway is not itself interfered with or broken up, and that its ordinary use is not restricted in any way.

The following examples may be cited to show the difficulties and delays resulting from the application of the present Acts in the case of statutory company undertakings.

(1) Application was made to a local authority for their consent to the erection of a portion of a long overhead line which passed through their district, and which was to be placed entirely on private land, except where it crossed over a public road and a privately owned footpath, but with a public right of way over it. No reply or acknowledgment was given for nearly two months, when a letter was received from a solicitor, who also acted as clerk to the local authority in question, stating that he had been instructed to advise the local authority on the application and asking to be referred to the applicants' statutory powers. After this had been done objection was raised to the route, which he maintained was too near to the footpath in question, and also too near to some farm buildings in another part of the route. In making these objections, he stated that he was aware of course of the functions of the Board of Trade, but that evidently from the provisions of the Act of Parliament some duty having reference to the safety of the public is imposed upon the local authority. All representations to the effect that questions of public safety might very well be left with the Board of Trade, which is specially charged with these matters, were of no avail, and negotiations had to be reopened with three separate parties in order to alter the route. After seven months had elapsed from the date of the original application, and notwithstanding repeated applications to be allowed to proceed with the work—which owing to the delay was causing great inconvenience and loss to an important industry—a reply was received pointing out that the only alternative to the erection of the line at the sole risk of the undertakers was the procuring of the consent of the local authority, and that such consent would not be given without an agreement. A further delay occurred while an agreement was drawn up, before it was felt reasonably safe to undertake the erection of any part of the line in this district. In this case seven and a half months elapsed before a commencement could be made with the work, and nine months before the consent was finally given.

(2) An application was made to another local authority for a consent in similar circumstances to the previous case. No undue delay occurred in this case in giving a reply, which was to the effect that consent would be given, provided the following conditions were agreed to:

(*a*) That where the line crossed any road, street, or footpath it must be placed underground at a minimum cover of 3 ft.

(*b*) That if any new road or street is laid out on the land where the line is situated, the line shall within 14 days (subsequently extended to three months) be placed underground.

It was represented to this authority that the Board of Trade allowed the carrying of electric wires overhead across roads with their approval as being perfectly safe, and a list of similar overhead crossings already erected with the consent of the local authority and of the Board of Trade in the neighbouring districts were submitted, and an invitation extended to inspect them. This was not accepted, and finally an interview was sought with the committee dealing with the matter.

At this interview questions were asked as to the particular objections to putting the line underground at each footpath and road. The technical objection to the insertion of lengths of underground cables into extra-high-tension overhead lines were explained as well as was possible to the non-technical mind, and the further objection of the increased and unnecessary expenditure which would be incurred in complying with this condition was pointed out.

No sooner was additional expense mentioned than further discussion was stopped and an intimation given that the reply of the local authority would be communicated in due course. This, as might be expected from the interview, merely reaffirmed the previous conditions, which finally had to be accepted.

(3) In another case application was made to a rural district council for their consent to the erection of overhead wires wholly over private land, except where roads and footpaths were met with. This consent was granted on condition that the line be placed underground where it crossed any road, bridle-path, or footpath, not only in connection with that application, but also in any future ones. An interview was obtained with the council, at which the matter was discussed, but they declined to modify their former resolution. Fortunately, in this case, the local authority being a rural district council, there was a right of appeal to the Board of Trade. Such an appeal was therefore entered and subsequently allowed by the Board of Trade. The total time taken to obtain this consent was over nine months.

These examples may serve to illustrate how many of these local authorities have but the haziest idea of why they stand possessed of the powers conferred in the clauses of the Acts already quoted. Some, and fortunately a good proportion, of these local authorities treat the matter as a mere formality to be complied with by the undertaker and consent readily; others, as we have seen, in the absence of proper enlightenment, usurp functions which properly belong to the Board of Trade; while in other cases it is difficult to discern the existence of that public spirit which one might look for in the representatives of an important community.

I am strongly of the opinion that it is essential that a right of appeal to the Board of Trade should be allowed in all cases, and that, while the local authority should have the right to be heard, it should have no absolute veto on such questions, and that all powers of interference in technical questions, such as design and questions of the public safety, without a reference to the Board of Trade, should be absolutely taken from them.*

A time limit should further be determined, say one month, as in the case of works on public roads, during which a local authority must either signify or refuse its consent, failing which such consent will be deemed to have been given, as the unreasonable delays which are at present possible in some cases should not be tolerated.

If there be any insuperable objection to extending the right of appeal in the somewhat special case of county boroughs, it should nevertheless be applied to urban district councils as well as to rural district councils.†

Many urban areas, at least in industrial districts, partake of the character of rural districts in their sparsity of population, and quite a large part of an industrial county, and often just that part where overhead wires are most needed, may comprise a number of contiguous urban areas.

(To be concluded.)

LIGHT RAILWAYS FOR THE ROADS.

A COUNTY COUNCILLOR'S SUGGESTION.

At last Monday's meeting of Gloucestershire County Council, the Highways report, presented by Sir Ashton Lister, laid stress upon the heavy damage to the roads by motor-'bus traffic, and the difficulties of maintaining the highways traversed by these vehicles. The roads were being worn out by traffic which they were not intended to carry. He considered that the roads should be widened, and a small light railway should be laid by the side to carry traffic which was now being taken by motor omnibuses, and thus leave the roads free for the purposes for which they were constructed, instead of allowing them to be used as semi-railways.

In reply to a question, Sir Ashton Lister said it was his idea that the railways should be provided by the county, and that they should either run the traffic itself and make a profit, or give a franchise to that class of people who at present were running the motor 'buses. He pointed out that similar light railways were installed with much success in Belgium before the war.

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* A local authority under sec. 6 of the Electric Lighting Act, 1882, may make by-laws for the safety of the public, but these by-laws must always be confirmed by the Board of Trade.

† This has already been allowed in a few cases in power companies' Acts—e.g., Kent Electric Power Act 1906, sec. 52.

The Decimal System of Coinage, Weights and Measures.

By HARRY ALLCOCK, M.I.E.E., A.M.I.MECH.E.

[From a lecture delivered on March 27th at the Institution of Civil Engineers, Sir Maurice Fitzmaurice, C.M.G., President, in the chair.]

In the past we, as a nation, have possibly been too prone to [illegible] that as we were, in effect, the [illegible] of the world, it was a matter of indifference to us that our customers abroad should be confused and annoyed by our complicated business systems, but to-day we have to admit that other nations are challenging our manufacturing supremacy, and that they have succeeded at least so far as to provide alternative sources of supply for those of our customers who were formerly obliged to come to us for their requirements, notwithstanding our discouraging methods.

We must remember that, other things being equal, international trade naturally flows along the lines of least resistance, and it is accordingly necessary for us to describe our goods in the language of the countries for which they are intended and otherwise so to improve our business systems as to make it easy for our present and potential overseas customers to trade with us.

Descending from the general to the particular, I think we may assume that every commercial contract contains references to money, weights or measures, and frequently to all three of these factors. It follows that the simpler and more widely understood are the bases of these three fundamentals, the better for those negotiating such contracts. When we realise also that our national existence depends upon our ability to sell British manufactured goods to all nations—*i.e.*, to develop a world-wide trade—it will be apparent that the United Kingdom more than any other nation would benefit by the establishment of universal systems of currency, weights and measures respectively.

COINAGE.

Apart from countries forming parts of the British Empire, practically all other countries of the world employ a decimal system of coinage, in which the current coined value usually represents one-hundredth part of the value of the monetary unit with subsidiary coins having values of 2, 5, 10, 20, or 25 and 50 times respectively that of the smallest coin.

It is also noteworthy that the British Empire is not solid in her abstention from the decimal basis, since Canada, Newfoundland, Egypt, the Straits Settlements and adjacent possessions, Ceylon, British East Africa and Uganda, and many other of our smaller possessions, all have decimal coinage.

When we consider that all financial transactions involving such everyday matters as dividends, interest on loans, discounts, commissions, &c., are based on a rate per cent., *i.e.*, per 100, and not per 20 or per 240, it must be obvious that our adoption of a decimal system of coinage would result in substantial economies both of time and labour.

Our cash entries would consist of two instead of [illegible] columns, and all additions and subtractions of [illegible] money would be based on simple instead of [illegible] methods.

Even adjustments of commodities, whether by way of [illegible] reductions of listed prices, or to specific alterations in fluctuating quotations, could be made more easily and in finer gradations, than is now possible.

The question naturally arises: How is it that, in view of these advantages, we still adhere to our relatively [illegible] system of four farthings in a penny, twelve pence in a shilling, and twenty shillings in the pound? I think the answer must be that for nearly a hundred years we have made sporadic attempts to decimalise our coinage, but that hitherto the forces of reaction and inertia have been too much for us.

I regret I have succeeded in establishing the demand for the decimalisation of our coinage, and we have now arrived at the question of the best means of giving effect to that demand.

At the outset it would appear that our object should be to [illegible] as much as possible of our existing system so as to [illegible] to a minimum such inconveniences as are incidental to any change.

Apart from this [illegible] we are confronted with the alternatives of either making our pound constant and [illegible] its [illegible] into tenths, hundredths and thousandths, or of keeping the penny constant and establishing new coins representing decimal multiples of a penny.

I hope I may take it that we are all agreed that it would be desirable to retain the British sovereign if possible.

Fortunately, we have in our present florin the exact tenth of a sovereign, and if we then divide the florin into 100 cents or mils instead of 96 farthings the decimal chain is complete.

Under this proposal the full set of decimal coins would be as shown in the following table:—

Coins.		Value in present currency.	Cash entry (two columns only).	
			Florins.	Cents.
Gold ...	Sovereign	Sovereign	10	—
	Half-sovereign	Half-sovereign	5	—
Silver ...	Florin	Florin	1	
	Shilling	Shilling	—	50
	Quarter	Sixpence	—	25
Nickel ...	10 cents	2·4 pence	—	10
	5 cents	1·2 pence	—	5
Bronze ..	4 cents	·96 pence	—	4
	2 cents	·48 pence	—	2
	1 cent	·24 pence	—	1

It will be seen that no alteration whatever would be made in the values of those of our existing gold and silver coins which are retained in this schedule.

The nomenclature could also remain the same, but in the case of our sixpence it would perhaps be an advantage to rechristen it as a "Quarter" instead of a sixpenny-piece, because, although it would be a true quarter of a florin, it would no longer represent sixpence.

The change suggested would thus only affect the values of the coins less than sixpence. The silver threepenny piece would be abandoned, and two new nickel coins of ten cents and five cents (equal to one-tenth and one-twentieth of a florin respectively) would be substituted.

Our bronze coins would, in effect, remain as at present, but their values would be slightly reduced, since there would be twenty-five new pennies (four-cent pieces) to the florin instead of twenty-four old pence.

The four-cent coin is included so as to provide a very close equivalent to our present penny, but I am inclined to suggest that this coin should be regarded as a temporary token to be withdrawn from circulation as soon as the public had become thoroughly familiar with the decimal basis.

This would mean that ultimately our coinage system would not contain any bronze coin heavier than our present halfpenny.

Hitherto the chief argument against the adoption of the above system has been that the values of our present bronze coins, our bronze coins only, would be depreciated by 4 per cent., on account of there being 100 cents instead of 96 farthings in the florin. But in these days, with our normal conception of values so violently disturbed by the war, it surely cannot be argued that a 4 per cent reduction in the purchasing power of the penny is a sufficiently powerful consideration to debar us from enjoying the benefits of decimal coinage.

With regard to the alternative proposal, in which the face value of our present penny would remain unaltered, it will be obvious that entirely new coins, representing ten and a hundred pence, &c., would have to be devised, and it will be apparent that under any such scheme the existing pound sterling could not survive, since it represents 240 instead of 200 or 250 pence.

I submit that it would be preferable to alter the penny and keep all other coins unchanged, rather than keep the penny and alter every other coin now in use.

There are further alternative decimal proposals based on an adoption of the dollar, the shilling or the farthing, to name only a few of them, but I

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submit the system herein proposed is the best of them all, as achieving our object with the least disturbance of our present coinage, and, furthermore, as facilitating comparisons between new accounts stated in florins and cents and old records expressed in pounds, shillings and pence.

It will be obvious that florins become pounds merely by removing the decimal point one place to the left, a mechanical operation involving no calculation whatever.

In our selection of the most suitable basis for a British decimal system I think we should resist the temptation to save ourselves temporary inconvenience at the cost of permanent disadvantages. In this connection, for instance, those who advocate the shilling as being preferable to the florin are quite correct when they claim that the ordinary man in the street would accept 38·50 shillings more readily than 19·25 florins as the equivalent of his wage, now expressed as 38s. 6d., but that convenience is a matter for a few weeks at the most, whereas the permanent advantages all rest with the florin.

Owing to our having grown accustomed to expressing values in pounds sterling it may be thought that the florin is an unduly small unit, but reference to the above-mentioned schedules of the world's coinage shows that the majority of other countries already employ monetary units of even less value than our florin.

It has further been argued that if we kept our accounts in florins and cents instead of in pounds, shillings and pence, more figures would be involved by reason of our having to write 10 florins instead of £1. This may be so where large sums are involved, or where entries are made in pounds only, but it is certainly not the case in normal commercial transactions.

Having, as I hope, established the advantages to be secured by rearranging our coinage on a decimal basis, and the comparative ease with which this change could be effected, I would urge that the present period of widely-fluctuating values is a most opportune time for introducing this overdue reform, and I should like to add that we are further helped by the circumstance that millions of our people are now gaining practical first-hand experience in the use of decimal coinage by their intimate contact with the decimal systems employed by all our Allies.

WEIGHTS AND MEASURES.

In our consideration of the coinage question we have seen how easily we could improve our present system by rearranging it on a decimal basis without abandoning our existing units.

This success naturally suggests the simplification of our weights and measures by a similar process, retaining in use, for instance, our pound, yard and gallon, &c., as foundations upon which to build a revised British system of decimal weights and measures. (Incidentally it will be noted that we instinctively turn to decimalisation when simplification is our object.)

Attractive as this course may appear at the first glance, we are soon confronted by the fact that the changes involved would be of a very far-reaching character, and that, even assuming their due accomplishment, we should find ourselves in the possession of an inherently bad system because of the absence of co-relation between our units of length, weight, volume and area. Furthermore, we should still be out of harmony with the rest of the world. We must therefore reject this method of attacking the problem.

When examining the possibility of establishing a universal system of coinage we saw that external influences, such as fluctuations in the rates of exchange, would always prevent international coins of equal nominal value from having at all times identically the same actual values. Such extraneous influences do not affect weights and measures, the kilogram and metre, for instance, in South America being always identical with the kilogram and metre in France or in any other metric country. The advantages accruing to the entire community by the adoption of one universal language of quantity are thus especially attractive.

(To be concluded.)

MUNICIPAL AND COUNTY ENGINEERS.

ELECTION OF OFFICERS AND MEMBERS OF COUNCIL.

At the last meeting of the council of the Institution of Municipal and County Engineers the returning officer reported that the ballot had resulted as follows:

President: Mr. P. H. Palmer.

Vice-presidents: Messrs. C. Brownridge, T. W. A. Hayward, and H. E. Stilgoe.

Ordinary members of council: Messrs. G. F. Carter, P. Dodd, E. J. Elford, W. T. Lancashire, E. B. Martin, F. Massie, W. H. Prescott, C. F. Wike, E. Willis, H. T. Chapman, E. E. W. Butt, and H. P. Foster.

Honorary Treasurer: Sir James Lemon.

The scrutineers drew the attention of the council to the large proportion of lost votes in the last election of ordinary members of the council, observing that this is apparently due to the regulations compelling each member to vote for the full number of council, including two associate members.

EAST MIDLAND DISTRICT.

Mr. E. George Mawbey, of Leicester, the district chairman, presided at the meeting of the Executive Committee of the East Midland District of the Municipal and County Engineers, held at the Guildhall, Nottingham, on Saturday, the 17th ult. There were present: Messrs. W. B. Purser (Grantham), district representative, C. A. Clewes (Derby), F. P. Cook (Mansfield Woodhouse), T. W. Gordon (Nottingham), T. Henry (East Retford), J. W. Horton (Derbyshire), and T. Wood (Leicester), acting honorary secretary. The nominations of district officers for the ensuing year were as follows: Mr. E. George Mawbey, district chairman; Mr. W. B. Purser, district representative, and Mr. T. Wood, honorary secretary.

The chairman presented the communication he had received from Mr. O. Claude Robson respecting the great desirability of augmenting the orphan fund, and urging that stewards should be appointed for each district. The undermentioned gentlemen have volunteered, and were appointed to act as stewards to represent the respective counties of this district, viz.: Mr. E. George Mawbey (Leicester)—Leicestershire and Rutland; Mr. H. Gilbert Whyatt (Grimsby)—Lincolnshire; Mr. F. P. Cook (Mansfield Woodhouse)—Nottinghamshire; Mr. H. James Kilford (Ilkeston)—Derbyshire.

A resolution, wishing "the best of luck and a safe return" to Captain E. H. Crump, R.E., and Lieut. W. H. A. Court, R.E., who are both on active service, was passed.

Cement Joints for Cast-Iron Water Mains.*

By CLARK H. SHAW, Assoc.M.Am.Soc.C.E.

About 1886 a cast-iron pipe line for water distribution was laid with cement joints at Redlands, Cal., and in 1891 joints of that kind were used at Los Angeles, Cal., but evidently with questionable results, as the method was not adopted. In January, 1907, Mr. Charles Thornburg, then superintendent of one of the water companies operating in Long Beach, Cal., decided to try cement joints for a 16-in. cast-iron pumping main, and instructed his foreman of construction, Mr. F. M. Shrode, to conduct some experiments.

No definite process was outlined to the foreman, but his experiments and practice in repairing steel riveted water mains under pressure, by using a dry mixture of neat cement in caulking the bands around these pipes, gave him an idea that a moist cement could be caulked into the bell solidly, and would produce the results desired. It was probably Mr. Shrode who, by this experiment, finally perfected the joint and used it in the construction of the entire line. When this line was completed and put into service, working under a static head of about 190 ft., several places showed some seepage, particularly at the lower end of the line, where the work was started, and it was decided to re-caulk these joints at the first opportunity; it was noticed, however, that the moisture was gradually drying up, and the seepage finally ceased.

Cast-iron construction was then abandoned by this company until 1911. During that year the works came into the possession of the municipality, and the writer was appointed engineer of the water department. After looking into the merits of the cement joint, as used on this 16-in. pumping main, it was adopted as the proper method of construction, and since that time it has been used throughout the entire system.

Long Beach now has 60 miles of cast-iron water mains, ranging from 4 in. to 24 in. in diameter, laid with joints of this type. All these pipes are under pressures ranging from 40 lb. to 80 lb. per sq. in., and are giving perfect satisfaction.

Method of Making the Joint.

In making the cement joint the pipe is placed and spaced in the usual manner. A thin backing of the best dry jute is used instead of oakum, as the jute is free from oils and grease (which should be avoided). A Portland cement conforming to the specifications advocated by the American Society for Testing Materials is used. The dry cement is placed on a piece of canvas (usually a cement sack ripped open), and moistened just so that when thoroughly mixed by hand it will be of such a consistency that when gripped tight it will hold the form of the hand, and when dropped 12 in. it will crumble. The canvas containing the cement is placed under the bell, and the cement is tamped into place by hand with a caulking iron until the bell is about half full. It is then caulked with heavy blows until the cement is thoroughly packed in the back of the socket. This process is continued until the bell is packed solid out to the face. A small bead of neat cement in a plastic condition is then put on, using the caulking iron as a trowel. As soon as the initial set of the cement in the bead has taken place the joint is covered with earth to protect it from the air and sun. In backfilling, the excavated material is always settled with water, which helps to cure the exposed portion of the joint.

The bead is essential, in the writer's opinion, as the cement packed in the bell is so dry that without protection it would absorb moisture from the water used in settling the trench, and it is believed that should the joint develop seepage when the pressure is put on in the main, the cement, being dry, would expand and aid materially in keeping the joint tight.

Experiments on cement joints constructed without the bead showed that, twenty-four hours after completion they absorbed water readily. In cases where seepage has developed and has subsequently closed, it is assumed that the dry cement absorbed the moisture from the inside, expanded, and filled the seepage pore.

About 20 per cent of the cement is wasted by falling off the canvas or being thrown out by the caulker. If any dust or earth from the trench falls on the canvas or in the cement, it is immediately taken out, together with enough cement to make sure that the remainder is clean. In mixing the cement with water, care is taken that there shall be no lumps in the material, no matter how small. If any cement is left on the canvas when a joint is completed, it is used on the next joint, provided the work is continuous, otherwise new batches are made. Special blunt caulking tools are used.

The joint is allowed to stand forty-eight hours before the pressure is turned on and the main is put into regular service. Cement joints have been used with satisfactory results, however, twelve hours after completion, but this is not considered safe practice. Pressure tests are never made by the writer prior to putting a main into service.

At San Diego, Cal., a pressure test was made by caulking a 6-in. cast-iron tee, one side of the tee being filled with a plug and each of the two ends filled with short lengths of cast-iron pipe with plugs caulked in the ends. As the pieces of pipe caulked in the tee were scrap ends cut from other pipes, they had no bead on the joint end, and, notwithstanding the fact that the joint was made with smooth pipe, it took a pressure of more than 300 lb. per sq. in. to force the pipe out. The test was made about 48 hours after the joint was made.

In another test, made at Winnipeg, Man., three lengths of 6-in. pipe were laid with four cement joints, on January 13, 1916. After six days pressure was put on the pipe in increments of 25 lb., and the joints were found to show no leakage or moisture up to 125 lb. At 150 lb. one joint showed moisture on the surface of the cement.

On January 24th another test was made, and at one joint moisture appeared at 175 lb. On January 31st this joint showed moisture with 200 lb., and also on March 15th, with a pressure of 255 lb. This joint was the weakest of the four. The pressure was kept on the pipe about one-half hour in each case.

The strength and rigidity of the cement joint are shown by the following instances where cast-iron mains have been subjected to severe tests: A new trenching machine was being tested by a sewer contractor in Long Beach, Cal. It operated parallel with and 5 ft. from a 6-in. cast-iron water main, with cement joints, which had been laid in January, 1915. The trench dug by this machine was 3 ft. wide and 18 ft. deep. Some time before noon on February 1, 1915, the side of the trench next to the water main caved in, leaving about 40 ft. of the pipe hanging and supporting about 2½ ft. of earth on top of it. This condition was not reported until the next morning, and at nine o'clock braces were put in to support the pipe. The main was under a pressure of about 65 lb. per sq. in. at the time. There was not the slightest seepage from any of the joints as a result of this strain.

Again, in June, 1915, 94 ft. of 4-in. cast-iron pipe with cement joints fell into a sewer trench, as the result of a cave-in under conditions similar to those just described. This pipe was under a pressure of about 55 lb. per sq. in. At one end it broke at a service connection; at the other end it broke near the spigot end of a pipe, about 8 in. from the joint, letting the whole 94-ft. section fall into the trench. In this case every cement joint remained intact. This line had been laid in March, 1913.

Several thousand feet of 8-in. and 10-in. cast-iron water mains with cement joints have been laid in made ground, the fill being silt from the dredging of harbour channels; also several thousand feet of 8-in. cast-iron pipe have been laid in fine beach sand, all are giving perfect satisfaction. An 8-in. cast-iron main with cement joints was laid in filled ground (the soil being clay) with only 6 in. of covering above the pipe when the line was put in service; the fill was then completed to 18 in. above the top of the pipe, and was rolled with a 14-ton steam road roller, without causing the slightest seepage in any of the joints. The rolling was done preparatory to paving the street in which the pipe

* Paper read on Wednesday at a meeting of the American Society of Civil Engineers.

was laid. This was a very severe test of the merits of the cement joint. At the time this rolling was done, had any seepage developed, it would have been readily detected, as the whole line was within 3 ft. of the edge of the fill. The fill was completed to a width of 80 ft. three months later, leaving the pipe 12 ft. from the centre of the street.

In several instances a cast-iron main laid with cement joints has settled 3 in., or probably more, in loose or filled ground, without developing any leakage. In fact, there is only one case that the writer can recall where the cement joint was not satisfactory. This was in a 6-in. cast-iron main on a dock, about 3 ft. from a railroad track. Many joints in this pipe have developed seepage, and some have small pin leaks, but the leakage is not considered serious enough to warrant closing down the line for reconstruction. This failure may be due to faulty construction, as the pipe was laid when the making of cement joints was in its infancy. However, the main is situated so that it cannot be entirely covered.

REMOVING CEMENT-JOINTED PIPES.

The cement joint can be taken apart in a very simple and economical way. The pipe is uncovered about one-half, or a little below the centre. At the joint where the original bell-hole was dug, the trench is usually made wider on the sides (but not deeper under the pipe), in order to permit the caulker to work at the joint. The upper half of the joint is cleaned out with a cape-chisel; then, with tripod and blocks, the free end of the pipe is raised until the lower half of the joint breaks free from the bell. The pipe seldom has to be pulled out of the bell, as it nearly always works itself out as the free end is lowered. If portions of the cement stick to the spigot end of the pipe, or fail to be entirely crushed in the bell, it is a very simple matter to clean out the bell with a cape-chisel, or knock the cement from the spigot with a hammer.

On occasions, after a joint has been cemented tight in the line, it is necessary to cut it out entirely (such as for laying a valve on its side; turning a tee or Y in another direction; adjusting a tee to conform to or meet a grade; avoiding a sewer connection or any other unforeseen obstacle).

American Roads and the War.—America will be faced with its road problem now that it has entered into the war. According to Captain W. T. Patten, in a paper read at the annual Road Builders' Institute, at Seattle, the roads of Washington would not hold up under the heavy traffic of military motor trains and the transportation of troops. To show the enormous weight highways would be subjected to, he gave statistics based on the army division, which consists of 22,000 men, about 7,500 animals, and 900 vehicles. The division would transport 2,160,000 lbs. with it. This total does not include the weight of the carriages or troops. Good roads are doubly essential for the transportation of military equipment by motor, he said, calling attention to the rapid breaking down of the trucks in the expedition into Mexico. The same trucks were giving satisfactory service in Europe because the roads were good, he declared.

"FIBERLIC" BUILDING BOARD.

At a time like the present, when rapidity of construction counts for so much, no excuse is needed for drawing attention to any means which will assist the building contractor to attain that end. The war has brought into prominence many time-saving materials, and among these the building board known as "Fiberlic" is well to the fore in the advantages it offers to its users as an inexpensive and efficient substitute for lath and plaster. Millions of feet of the board have been supplied for work under the Admiralty, the Office of Works, the War Office, and the Ministry of Munitions. The last-named Department have passed it on for use on housing schemes in various parts of the country, and we reproduce below a photograph of a munition worker's recreation room, the walls of which have been lined with the material.

Being manufactured from a fibrous root of remarkable toughness and strength, "Fiberlic" possesses great rigidity; it has, moreover, high fire-resisting properties, is damp-resisting, sound-deadening, a non-conductor of heat and cold, and is sanitary and vermin-proof. In use it is nailed directly on to the studding of new walls, or in the case of existing walls it is nailed to furring strips.

It must not be supposed that "Fiberlic" is employed only for temporary work; once erected it will, the makers assert, last as long as the building in which it is incorporated, it being impossible for it either to crack or fall; in fact, it is said to improve with age. It can be erected by any artisan, and its decoration is a matter of ease, as any paint or stain that can be used on wood can be applied to it.

Munition Workers' Recreation Room Lined with "Fiberlic."

We understand from the makers, Messrs. MacAndrews and Forbes, Ltd., 2, Broad-street-place, London, E.C. 2, that there are large stocks lying at various depots throughout England, and that goods can be put on rails very promptly. A sample of the material will be sent to Surveyor readers on application to the company.

Action of Sea Water upon Metals.—For various reasons, none being due to the war, delay has occurred in carrying out the arrangement made last year by the Corrosion Research Committee for the utilisation of part of the premises of the Brighton electricity power station at Southwick for experiments in the action of sea water upon metals. It is now understood that the difficulties have been partly overcome, and that a start will be made at an early date. Two investigators have been appointed, who will watch the operations and explain the nature of the tests and their results. Tubes are to be placed in the condensers of the power house, and the effect will be compared with other tubes utilised elsewhere, in order to ascertain the influence of certain protective processes. Mr. John Christie, the manager and engineer of the undertaking, is (says the *Sussex Daily News*) giving every assistance to the carrying out of these experiments. The sea water tests will be supplemented by others, which are expected to yield valuable information to the engineering profession, especially in the direction of the uses of pure copper.

SCOTTISH NOTES.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Scottish Notes," 24 Bride-lane, Fleet-street, E.C. 4.]

Housing and Town Planning. The writer has on a previous occasion referred to the position of housing and town planning in Scotland. The prominence the matter has received lately is his apology for reverting to it again.

* * * *

Rosyth and Town Plan. A writer in a Scotch building trades journal recently remarked, "We cannot get away from Rosyth." Mr. Ponsonby, M.P. for the Stirling Burghs, seems determined that the Government shall not be allowed to forget the delay in connection with the town planning scheme for the Rosyth area of the city of Dunfermline. Mr. Ponsonby returned to the attack lately, and his questions were very much to the point. The Scottish Secretary's excuse that the officials of the Scottish Local Government Board are engaged on other work of national importance is but "begging the question." Nothing can be of more importance than the assuring that the development of what is practically a new town shall be on right lines. If, as the writer is credibly informed, some 600 houses have already been erected, and another 1,000 are about to be erected in the area, surely it is full time that the city council of Dunfermline were freed from the limitations of an emergency Act and given the powers contemplated in their town planning scheme?

* * * *

Co-Housing. Another body wishing to keep Rosyth before the Government is the Scottish National Housing Council. A deputation from this council recently waited on the Civil Lord of the Admiralty (Mr. Pretyman) at the Admiralty to press for a reduction of house rents at Rosyth. It is understood that the workmen who have come to Rosyth from English districts are having to pay rents in excess of what they were accustomed to further South. Before commenting on the situation the writer would be obliged if surveyors in dockyard towns, particularly in the South of England, would give him some information as to size of house, area of garden ground, average rent, rates, taxes, water rates, &c., in their respective areas. With this information he will return to the subject later.

* * * *

Still another body has of late been making itself heard in the interests of housing—the writer refers to the Scottish Labour Housing Association. Its members are drawn from trade unions, co-operative societies, trade councils, and Labour and Socialist organisations. At a recent meeting this body passed the following resolution: "That this conference condemns the Government for having failed to provide adequate housing accommodation at Rosyth, protests against the policy of granting money to a private company for the erection of houses, and calls upon town councils and local authorities to take immediate steps to have plans prepared for the erection of suitable dwelling-houses sufficient to relieve the congestion in their neighbourhood; further, that town councils and local authorities be urged to request the Government to give grants of money, free of interest, for the erection of such houses, so that ample accommodation may be provided at rents within the reach of the workers."

* * * *

In framing the above resolution, have the associations overlooked the fact that, while housing is important very important the Government are responsible more than bread with matters, not Scottish only, but of national importance, on the success of which depends the very life of the nation? The writer would point out that money has not been lent to a private company, but to a public utility company formed under the powers of the 1914 Housing Act, a company whose operations are under strict Government supervision, and whose profits are restricted to 5 per cent. How they are to make a profit of 5 per cent. with the present cost of material and labour would be of interest. The writer fails to agree with the policy of "no interest," believing that wages should be made adequate to enable the worker to pay an economic rent. He has not reproduced the resolution for the purposes of criticism or of depreciation, but rather to show—as the whole "Notes" are intended to—the widespread and deep interest which this question has aroused in Scotland.

* * * *

The writer recently referred to the formation of a Scottish Committee of the National Housing and Town Planning Council. This committee is composed of members of town and county councils, the leading municipal and county officials, members of architectural and building trade associations, and miners and other trade unions. From its composition it will be seen that all shades of opinion are represented, and it can be trusted, through its committees, to make its influence felt—an influence which, when the happy days of peace return, is calculated to bring to fruition those reforms in housing which are so urgently required. May it never be said of Scotland that it sent its sons to fight for its freedom and liberties and brought them back to live in slums and hovels!

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ
(One man does not see everything.)
—Euripides.

ENGINEERS AND FOREIGN LANGUAGES.

To the Editor of The Surveyor.

Sir,—I have been much interested by your article on languages in connection with the examinations held by the Institution of Civil Engineers, and especially by your reference to Esperanto.

But allow me to point out that the expression "universal language" tends to mislead; national languages (mother tongues) are unlikely ever to be superseded for home use. But the international language, Esperanto, as an auxiliary for international use, is already in existence, and at the service of all who choose to avail themselves of it. It is not, as some think, a mere scheme of a few cranks; it is an actual living language, in constant use for international intercourse and correspondence, by large numbers of people of all countries. A well-known English Esperantist has stated that he met people with whom he could converse in Esperanto in every country in Europe, except Iceland, which he had not visited. The Universal Esperanto Association has 1,800 "consuls," or official representatives, in forty-four different countries. Before the war annual international congresses were held in various countries, at which Esperanto was the only language used; one of the latest, held in Antwerp, was attended by 1,700 persons, representing forty-two nationalities. The London Chamber of Commerce has included this in its examinations in languages—an example which might well be followed by the Institution of Civil Engineers. In Petrograd, the Russian Chamber of Exports (under the auspices of the Ministry of Commerce, &c.), which recently accepted correspondence only in Russian, English, and French, has now added Esperanto to the number.

To engineers Esperanto should especially commend itself, on account of its scientific construction and regularity. It is a language of precision, and therefore well suited for scientific purposes; each word has only one meaning, as definite and unchangeable as the laws of physics; the rules (16 only in number) of the simple and logical grammar are as fixed and invariable as the laws of mathematics; it contains no idioms. After three months' tuition, learners can use it for international correspondence with Esperantists of any foreign country. In the time which would be necessary to acquire a mere smattering of an ordinary foreign language a person can learn to read, write and speak Esperanto with ease, fluency, and grammatical correctness.

Information will be gladly sent (gratis) on application to the Rev. A. J. Ashley (hon. secretary, E.E.L.), The Vicarage, Farnley Tyas, Huddersfield. An excellent and complete text-book, "The Esperanto Teacher," can be obtained for 7½d. (post free) from the British Esperanto Association, 17 Hart-street, London, W.C. Half an hour devoted to the subject will give an intelligent reader a general idea of the practical nature of this marvellously clever language.

—Yours, &c.,

A Retired C.E.

April 17, 1917.

DAMAGE BY MOTOR OMNIBUSES.

LONDON COMMISSIONER OF POLICE PROPOSES LIGHTER VEHICLES.

Proposals of considerable importance, and of not a little interest to metropolitan road engineers, are contained in the following memorandum on the construction of motor omnibuses which has been issued by Sir Edward Henry the Commissioner of Police for London:

"The Commissioner of Police of the Metropolis, as the authority for licensing public carriages, desires to make the following representation with regard to the future construction of motor vehicles intended for licensing as motor omnibuses within the Metropolitan area.

"By the Heavy Motor Car Order, 1904, it is enacted that the maximum unladen weight of a heavy motor car may not exceed five tons, and, if it is to be operated up to 12 m.p.h., the registered axle weight of any axle may not exceed six tons. In the past it has been found that the passage through the streets of motor omnibuses approaching the maximum of unladen weight and of permissible speed caused much annoyance and damage through noise, vibration, &c., though fitted with rubber tyres, as provided by the Order.

"Acting upon expert advice, the Commissioner, in 1909, after a conference with manufacturers and users, laid down a rule that no new vehicle would be licensed for public service which exceeded three and a half tons unladen weight, or, alternatively, exceeded a gross weight, fully laden, of six tons. Even with these limitations of weight, complaints of damage and annoyance continue, and the time appears opportune for reviewing licensing requirements, as the demand for chassis and parts consequent upon the war having exhausted old stocks, new construction will, when circumstances permit, have to be undertaken before new vehicles can be put upon the market.

"The experience and the developments of the last six years in the mechanical properties of materials and in designs of structural details lead the Commissioner to anticipate that it will be possible to construct vehicles to meet the requirements of the public service in London with a lower unladen and gross weight than three and a half and six tons respectively. It is well known to manufacturers that since 1909 methods of production of gearing have been developed which will make it practicable to obtain silent and efficient working with lessened total weight of transmission mechanism, and some reduction may be expected in the total weight of power and of transmission mechanism throughout. Attention is also called to the method of inside lighting and of outside advertisements, as it is possible that saving in weight in connection with them might be effected.

"The Commissioner deems it necessary, therefore, to give timely notice that new vehicles presented for licensing must be of a type differentiated from existing types by being lighter in weight, and with a better form of power transmission. He invites the co-operation of manufacturers in designing and constructing vehicles which can operate in the streets without affording grounds for complaints as to the damage done to residential property by the excessive vibration they cause, owing to their weight, and as to the annoyance caused by faulty power transmission.

"The interests of the community and of the operating companies in this matter are the same, as the introduction of a perfected type of vehicle would greatly popularise the omnibus service, to the benefit of both the operating companies and the public; the Commissioner feels sure that he can in these circumstances rely upon the cordial help of manufacturers. Any representations they may put forward will, of course, receive the most careful consideration."

Sheffield Corporation's Appeal.—The town clerk of Sheffield has received instructions to give notice of appeal against the verdict of a jury at the last assizes, when damages, amounting to £660, were awarded against the corporation in respect of injuries sustained by Mr. Thomas Morrison, who lost his left eye in consequence of his colliding with a tree guard on the footway. A note of the case will be found in our issue of March 30th, p. 319.

THE TRIBUNALS.

AN ASSISTANT SURVEYOR'S EXEMPTION.

At the Woking Tribunal the Woking Urban District Council applied for the further exemption of Mr. George Frederick Hawkins (forty), married, B 3, assistant surveyor to the council, in which occupation he had been for fourteen years.

The military representative contended that the man's usual occupation was not a certified one, and even if it were, it was no longer in the national interest that he should continue in civil employment.

The Advisory Committee recommended a further period of exemption.

Mr. Brown alluded to the probability at one time of Mr. Wooldridge, the surveyor, going to France, and asked if Mr. Hawkins would not then have been left alone to do the work.

Mr. Wooldridge said "No." It was impossible for him to do the work alone. Over £20,000 worth of work passed through the office every year, apart from special work necessitating a loan. His time would be entirely taken up by keeping accounts. He added that he thought that as Mr. Hawkins was not in a high category, he would be doing more useful national work by remaining in the service of the council than by acting as a clerk, for instance, in the Army Pay Corps.

The Tribunal decided to give three months' further exemption, and Mr. Wooldridge was advised to seek a substitute.

At Horsham, West Sussex, Urban Tribunal, on Tuesday, application was made by the military for a variation or withdrawal of the exemption of a county district surveyor, 29, married. As the man's exemption would expire in the ordinary course on May 14th, the certificate was not varied, and the application was refused.

At Plymouth Panel of Devon Appeal Tribunal on Saturday, Mr. Rowe, chairman of Tavistock Rural District Council, opposed the appeal of the military authority against the exemption of Mr. Francis Geo. Cornish, twenty-eight, married, B 1, surveyor of main roads for the rural district. He had charge of 197 miles of road. They had another surveyor, sixty-one years of age, with 230 miles of road to look after, and he did not think it possible for one man to look after both. The council were unanimous in their desire to resist the appeal. There was much tree-felling going on, the roads were being badly cut up by the Government, and this man was the only one who could sign the certificate as to damage for extraordinary traffic. The military appeal was allowed.

At the Hexham County Tribunal, in a military appeal against the exemption of a West Tynedale highway surveyor, Mr. G. A. Lightfoot, who appeared for the appellant, said it was rather a case of beating the air. The surveyor was granted temporary exemption till March 31st by the local tribunal, and it seemed a waste of time to appeal against something which had expired. The Tribunal could not deal with a thing that had come to an end. It must go again to the local Tribunal.—Captain Taylor: Has he applied to the local Tribunal?—Mr Lightfoot: I don't know, but he will apply. Captain Taylor: He will be out of date.—The clerk to the rural council in question stated that the surveyor had put in an appeal.—Captain Taylor: I will have to leave it there, if he has an application in.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRY HELD.

Lisburn U.D.C. (April 11th. Mr. P. C. Cowan).—This was an application for a Provisional Order to alter and amend a section in the local Act to enable the council to raise the limit of the price of gas to consumers from 4s. to 6s. 6d. per 1,000 cub. ft. There was no opposition on the part of the ratepayers. It was stated that unless the present price (4s. per 1,000 ft.) was increased there would be a loss on the working of the undertaking. This year there was a deficiency of £1,500. The council paid £34,000 for the works, obtaining possession on January 1, 1911. For the first two and a half years the total loss was £3,685.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Enniscorthy R.D.C.—The council have accepted a tender at £785, for rebuilding two arches of Clotamon Bridge, which were destroyed by December floods.

Falmouth T.C.—Inquiries are to be made of the Ecclesiastical Commissioners with respect to a site for a small-pox hospital to be erected in conjunction with the Port Sanitary Authority.

Sheffield T.C.—The Finance Consultative Committee have approved of an expenditure of £4,000 on extensions at Lodge Moor Hospital.

HOUSING AND TOWN PLANNING.

Tilbury U.D.C.—The engineer and surveyor, Mr. S. A. Hill-Willis, reporting on the position of the erection of cottages for housing transport workers now in hand, stated that certificates had been issued by him for £32,706, payable to contractors to date; also that 115 cottages were now completed and occupied. Mr. Hill-Willis gave further details of the work now in hand.

MOTOR TRANSPORT.

Bishop Auckland R.D.C.—A report is being prepared on the suitability of motor traction for haulage purposes.

East Ham T.C.—The town council are considering the adoption of electric vehicles for the collection of house refuse.

Hemel Hempstead T.C.—It is proposed to purchase a motor tractor for the use of the fire brigade.

Stoke-on-Trent T.C.—It has been decided to purchase an electric vehicle from Ransomes, Sims & Jeffries, Limited, for the purpose of coal cartage.

REFUSE COLLECTION AND DISPOSAL.

East Kerrier R.D.C.—It was reported that only one tender had been received for the scavenging of Flushing, and that this was £80, as compared with £70 last year. The inspector reported that he had received several complaints. He had spoken to the contractor but could not do anything with him, and got nothing but abuse. A councillor said the Sanitary Committee were of opinion that the council ought to do the scavenging itself, but the council decided to accept the tender.

Richmond (Surrey) T.C.—It has been agreed to pay the contractors an additional 1s. per ton for the removal of house refuse by rail during the war.

Taunton T.C.—At the last meeting the Main Drainage Committee stated, in reference to the recent circular letter of the Local Government Board urging upon local authorities the desirability of taking steps to secure that waste food, waste paper, bottles, jars, and tins are collected and utilised, that the borough surveyor, Mr. D. Edwards, had reported that practically the whole of the waste food in the borough was now systematically collected and used for the feeding of pigs and poultry; in regard to bottles, jars and tins, the scavengers were now allowed to take them for sale and sell any such articles, while the refuse bins at the works were by arrangement systematically picked over by men employed by a local dealer, so that any articles not picked out by the scavengers were thus saved. The matter of the collection of waste paper was embodied in the report of the Health Committee. The committee had given careful consideration to a suggestion made by the borough surveyor that arrangements should be made for the systematical tipping of house refuse.

ROADS AND MATERIALS.

Aberdeen C.C.—The Alford District Committee have referred to the Road Sub-Committee the question with respect to the liability of the Government for the repair of damage caused to the roads in connection with the haulage of timber.

Bognor U.D.C.—The council have accepted the tender of Messrs. Forbes, Abbott & Lennard, for the supply of 7,000 gallons of prepared tar at 3¾d. per gallon.

Derbyshire C.C.—With regard to the proposed improvement at Grindleford of the Grindleford and Hathersage road, it is hoped by the Highways Committee that the purchase of the land required will be completed in order that the work might be carried out before the summer traffic commenced.

Easingwold R.D.C.—The surveyor, Mr. G. Thompson, submitted his estimate of expenditure on the district roads for the current year. The roads, he said, had considerably deteriorated during the past three years, and the severity of the winter, together with the scarcity of materials, had made them as bad as they were in pre-roller days. Some idea of the state of the roads could be gathered from the fact that the estimate had been underspent by £2,360. His estimate for the present year's expenditure was £4,729, as against £4,990 last year. They might not spend all the money, however, in view of the difficulty of getting material.

Gloucestershire C.C.—At last Monday's meeting the report of the Highways, Works, and General Purposes Committee stated that, in order to prepare for the period after the war, five schemes of road improvement had been agreed upon.

Hambledon R.D.C.—The surveyor, Mr. S. B. Hasell, has been instructed to see the military authorities with a view to their supplying the necessary labour for carrying out the proposed improvement of the road at Lasham's Hill. The surveyor reported that further material had been taken from the side of the roads by the military authorities, and he was authorised to ascertain the quantity, and send in an account in respect of the cost.

Helmsley R.D.C.—It has been decided to pay farmers 9s. a day for a man and cart with one horse for leading, and 12s. for two horses.

Holland C.C.—Upon the suggestion of the surveyor for North Holland, Mr. H. Moody, the Roads and Bridges Committee have decided to purchase a midget tar-sprayer (price £6 15s.) for filling up potholes in the roads. Mr. Moody stated that the machine he had been using belonged to South Holland, and the chairman (Captain Gleed) remarked that it had been very successful in that district.

Hythe T.C.—The borough surveyor, Mr. C. Jones, reported that, as a result of correspondence with the county surveyor, he had placed an order with the Tarmac Company for the laying of tarmac as far as the Sandgate boundary. The council confirmed the borough surveyor's action, and expressed their appreciation of the county surveyor's agreement to the suggestion.

Littlehampton U.D.C.—The council have accepted the tender of Mr. A. E. Thomas for the supply of two street orderly trucks at £5 7s. 6d. each.

Rhyl U.D.C.—The surveyor, Mr. A. A. Goodall, reported that during the past month he had removed 1,349 loads of sand from the East and West Promenade and roadways. The filling up of the old hospital site, east of the pier, had been completed, and the work of clearing the sand from the footway on the Marine-drive was proceeding. He was going on with the planting of marram grass on the sandhills to check further drifts. Further damage by erosion at the foundations of the west end of the Promenade had occurred, and he still regarded the situation there as alarming. The clerk was asked to write to the Office of Woods and Forests with reference to erosion by sea and river at Foryd, and damage to the West Promenade wall foundations.

Seaham Harbour U.D.C.—It has been decided to purchase a tar-spraying machine for £91.

Slaithwaite U.D.C.—An authorisation has been received from the county surveyor for the surface-tarring of 4,950 yds. of main roads.

Swansea T.C.—The borough surveyor reports that the reduced expenditure on the highways during the past two financial years must have the natural consequence that the highways could not be kept up

in the condition they should. The estimates for the forthcoming year provided for a less sum than for the past five years, in spite of the fact that the price of materials, for haulage, and also wages, had increased by 50 per cent. The wear which was taking place on the highways was not being replaced to the same extent as in past years, and more money would have to be paid on the highways in years to come to make up for the present state of things. Traffic on the highways had increased, and the heavy motor traffic had a very destructive effect.

Totnes R.D.C.—It was reported that the outlook with regard to the condition of the roads in the district was serious. Timber hauling for Government purposes was doing thousands of pounds worth of damage. It was decided to record details of the damage and apply for a Government grant.

Weston-super-Mare U.D.C.—The Main Roads Sub-Committee of the county council intimate that they have authorised a grant of £101 for surface tarring a total length of 3,695 yds. of roads.

Wigtownshire C.C.—At the Rhins District Committee the road surveyor stated that the road from Gass to Glenluce had been badly cut up by the heavy haulage of timber. The sub-committee considered that the Marquis of Bute should be asked to pay two-thirds of the excess of the cost of repairing and maintaining the road, and the whole of the cost of raising the road at each side of the Dumphail Bridge. It was stated that the Marquis of Bute had agreed to pay the total cost of raising the approaches to the bridge, but offered to pay only one-half of the excess cost of maintaining the road.

SEWERAGE AND SEWAGE DISPOSAL.

Alcester R.D.C.—The sanitary surveyor, Mr. Cyril B. Machin, has been authorised to purchase at a cost of £60 a belt-driven geared pump for sludge from Messrs. Tangyes, Birmingham, for the sewage works, where he is carrying out improvements.

East Grinstead R.D.C.—The Local Government Board have written stating that the council had included among works to be done after the war a further scheme of sewerage for Worth, for which no sanction had yet been given. They suggested that, in order to save delay when the work could be undertaken, the council should submit definite proposals as soon as practicable.—It was explained that circumstances had considerably altered since the original scheme was adopted, and it was decided to inform the Local Government Board that the council was not in a position to proceed with the matter at present.

Haslemere U.D.C.—It was reported that sixty-one earth-closets had been converted into water-closets during the year.

WATER, GAS, AND ELECTRICITY.

Arundel T.C.—The town council have resolved to discontinue public lighting during the operation of the Summer Time Act.

Aylesbury T.C.—It is proposed to instal additional plant at the electricity works, at a cost of between £5,000 and £6,000.

Merthyr T.C.—Mr. T. F. Harvey, the engineer, has been appointed controller of the water supply, with power to institute measures for safeguarding the supply. It was stated that whereas in 1915 the consumption of water was 32 gallons per head, it is now 40 gallons, this being due to burst pipes and services consequent upon the winter frosts, and the shortage of plumbers to cope with the leakages.

Sheffield T.C.—A scheme is proposed for the increase of the plant at the Neepsend electricity station, at an estimated cost of £19,450.

Southport T.C.—The year's working of the electricity undertaking shows a nett profit of £2,682, an increase of £469 upon the previous year.

Swansea T.C.—The town council have approved the Electric Lighting Committee's proposal for the installation of additional plant at the electricity works.

Taunton T.C.—A sum of £385 has been transferred from the profits of the waterworks undertaking to the District Fund.

Wolverhampton T.C. The Electricity Committee have submitted a recommendation for the extension of the electricity plant, at an estimated cost of £67,100.

MISCELLANEOUS.

Holborn B.C.—The borough council have passed a resolution in support of the "Keep to the left" rule of the footpath, proposed by the Safety First Council.

Lowestoft T.C.—The borough surveyor, Mr. G. H. Hamby, has received instructions to carry out his proposed improvement on the South Beach.

Tilbury U.D.C.—With reference to the War Agricultural scheme as the officer responsible for the control of allotments, the engineer and surveyor, Mr. S. A. Hill-Willis, reported that he had had to deal with a large number of applicants, and the staff had departmentally ploughed 13 acres, 32 rods out of 32 acres 71 rods, mostly let in 10-rod plots. It was resolved to approach the Sewers Commissioners and utilise the land claimed by them for further applicants. The engineer and surveyor also reported that the Director-General of National Service had caused a committee to be formed for Tilbury. The chairman of the committee, who is also chairman of the council, had invited him to take up the hon. secretaryship. He had taken up the duties pending a meeting of the council, and was prepared to receive instructions as to whether he was to continue to carry out the work. The council unanimously approved of the action of the engineer and surveyor, and it was agreed that he be permitted to act in the capacity of hon. secretary.

Uckfield R.D.C.—The council have appointed two committees to deal with (1) the cultivation of gardens, the keeping of pigs and other animals, the utilisation of refuse matter, and the establishment of a municipal kitchen; and (2) to deal with the reduction of food consumption and the prevention of waste of all kinds.

ROAD MAINTENANCE DIFFICULTIES.

THE DEARTH OF LABOUR AND MATERIALS.

At the last meeting of the Norfolk County Council Mr. W. W. Gladwell, the county surveyor, stated that the application of materials to road surfaces had been retarded to a considerable extent owing to the shortage of labour and the unfavourable weather conditions. Damage had been caused to several sections of roads by the frost. In consequence of seven of the steam rollers having been acquired by the Government, the undesirable method of carrying out the work appertaining to maintenance by extensive patching of road surfaces had to be resorted to, with its consequent attendant but unavoidable evil, that of discomfort to the users of the highway. The roads were still being subjected to heavy military traffic, and from this cause and the dearth of labour and materials deterioration was very apparent. He regretted to have again to report as to the non-delivery of materials. There was a shortage in the supplies on the quantities allowed for 1916-17 of 17,653 tons of granite, and 20,157 tons of gravel; the deficit, including that of 1915-16, being 25,838 tons of granite and 35,477 tons of gravel. The difficulty in obtaining team labour had much increased since his last report. There were 248 fewer men employed upon the roads than at this period of the year 1914. The services of the roadmen in many instances were being utilised for agricultural purposes.

THE WEAK ROAD IN WINTER.

In the course of a recent meeting of the Cornwall Main Roads Committee, the county surveyor, Mr. Thompson, stated that some of the roads were so weak that they suffered considerable damage during the ordinary winter, and during the thaw which, in February, terminated the lengthy period of frost they were rutted, cut up, and otherwise damaged to a most serious extent. The perfectly strong roads were not injured to an appreciably greater extent than usual. The badly damaged lengths were being rutted, patched, and temporarily levelled as rapidly as possible, with a view to preventing further damage, as well as to make them more fit to carry the traffic. On many roads good maintenance was made a much more difficult matter by the bad cross section, the water-tables being deep and the carriageway so highly crowned that the traffic was concentrated in the centre, with the result that ruts were continually forming. It was highly desirable from all points of view to ballast up the water-tables and widen out the carriageway and reduce the crossfall in many places.

PERSONAL.

Mr. Alexander Tweedie, who was burgh engineer of Annan from 1893 to 1902, died recently, we regret to state.

Mr. Charles Hinchliffe, of Slaithwaite, who was recently appointed surveyor to the Penistone Urban District Council, has written that for private reasons he has decided not to accept the position.

Mr. T. G. Lindale, surveyor to the Northallerton Rural District Council, has been voted a grant of £60 to meet the increased cost of travelling. Hitherto he has not received any allowance for expenses.

Mr. Samuel Evans, county surveyor and bridge-master of Flintshire, has accepted the position of assistant engineer, with the rank of Captain, in the Royal Engineers, for road service in France.

Mr. A. J. Smith, borough surveyor of King's Lynn, has been granted a commission as Second Lieutenant in the Royal Engineers. In his absence the electrical engineer, Mr. C. W. Jackson, will superintend the waterworks, the county surveyor has promised to attend to the main roads, and the clerical work will be done by Mr. Newstead.

Mr. G. L. Butterworth, surveyor to the Thanet Rural District Council, has obtained an appointment, with the rank of Captain, in the Military Roads and Railways Department of the Royal Engineers, for service in France. Mr. E. A. Ridsdale, chief sanitary officer of Margate, will carry on the sanitary duties of the office, and Mr. E. Gore, road foreman, will look after the other work in Mr. Butterworth's absence.

Messrs. D. T. G. Brown, engineer and surveyor to the Sherborne Urban District Council, and F. Hatcher, surveyor and water engineer of Porthcawl, have been recommended for election as members, and Messrs. A. V. Dibble, engineering assistant, Southampton; J. Mayho, engineering assistant, Burnley; and E. D. Robertson, assistant borough engineer's office, Hemel Hempstead, as associate members of the Institution of Municipal and County Engineers. In addition, Messrs. T. J. Blake, assistant surveyor, Newmarket, and H. K. Hinds, senior pupil to Mr. A. D. Barron, Douglas, Isle of Man, have been recommended for election to studentship.

Mr. Frank Latham, borough surveyor of Penzance, who joined the Army recently as Second-Lieutenant, has been promoted to the rank of Captain. The town council had decided to make him an allowance of £150 a year while on service, and Mr. Latham has written that, as his emoluments were considerably higher than when he left them, he desired the Finance Committee to consider the matter with a view to a reduction of the allowance corresponding with the increase he had received. Mr. Thomas, chairman of the Finance Committee, said that if Captain Latham was spared they might be sure he would return with honour to himself and the borough.—The question was left in the hands of the committee.

OBITUARY.

Mr. Peter Monteith, chief inspector of works to the Glasgow Corporation, died on Saturday, we regret to state. He had been for forty years in the office of the master of works, serving under three heads of the department.

Mr. Frederick Taylor, deputy surveyor of Lincoln, died recently, we regret to state. He had held the position for between fourteen and fifteen years, and was responsible chiefly for architectural work and for repairs on corporation properties. He designed the conversion of the former National School into the present corporation offices, with the additional departments off Saltergate, and also designed the electric lighting of the City Hospital and, more recently, the crematorium.

Mr. Benjamin Hey, sanitary engineer and surveyor to the Rotherham Rural District Council, died, we regret to state, on the 12th inst., aged 70. Before proceeding to Rotherham, sixteen years ago, he held an appointment at Skipton, and his earlier training was at Keighley, of which town he was a native. Much important work had been under his direction whilst at Rotherham owing to the transformation of villages necessary through colliery developments. He had been actively associated with the carrying out of sewerage and water schemes, including one for the water supply of villages between Aston and Ravenfield, involving an expenditure of £17,000.

COTTAGE CONVERSION IN RURAL DISTRICTS.

GODSTONE COUNCIL'S RESOLUTION.

At the last meeting of Godstone Rural District Council, the Plans and Buildings Committee reported that plans had been presented for the conversion of three cottages into a dwelling-house at Yew Tree Farm, Felbridge, South Godstone. The surveyor, Mr. T. C. Barralet, reported on his interview with the owner and the architect as to the undesirability of diminishing the number of cottages in the district at the present time. The committee recommended that the plan be approved, but with great regret that the owner of the cottages did not see his way to meet the wishes of the committee as expressed through their surveyor.—Mr. Lindley, proposing the adoption of the report, said the committee regretted that they had no power to act otherwise in the matter.—The council eventually passed the following resolution: "That this council desires to express its opinion that such action of owners in diminishing the number of workmen's cottages by converting them to more important houses is opposed to the public interest."

FOR OTHER ADVERTISEMENTS

See End of Paper.

LEIGHTON BUZZARD URBAN DISTRICT COUNCIL.

TEMPORARY APPOINTMENT OF SURVEYOR AND INSPECTOR OF NUISANCES.

The above Council invite applications from persons, ineligible for military service, for the appointment of Surveyor and Inspector of Nuisances to the above Council.

The appointment will be a temporary one (to enable the Council's Surveyor and Inspector of Nuisances to be released for military service), and will be terminated when the present Surveyor and Inspector of Nuisances returns from military duties.

Salary at the rate of £60 per annum as Surveyor, and £60 per annum as Inspector of Nuisances (subject to the approval of the Local Government Board).

Applications, stating age, qualifications and experience, should be sent to me, with three recent testimonials (copies only), not later than Wednesday, the 25th inst., endorsed "Surveyor, &c."

REGINALD F. A. TUTT,
Clerk of the Council.

Council Offices,
Leighton Buzzard. (3,389)

URBAN DISTRICT OF FINCHLEY.

SURVEYOR'S DEPARTMENT—TEMPORARY ASSISTANT.

The Council of the above-named District invites applications for the position of a Temporary Assistant in the Engineer and Surveyor's Department, at a weekly salary of 2½ guineas.

Candidates must be thoroughly competent to take levels, make surveys, prepare drawings, and assist generally in the routine work of a drawing office.

Preference will be given to candidates who are holders of the Certificate of the Institution of Municipal and County Engineers. The period of appointment will be for the duration of the war, and applicants must not be eligible for military service.

Applications, endorsed "Temporary Assistant," accompanied by copies of three recent testimonials, to reach me not later than 1st May next.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End, Finchley, N. 3.
April 17, 1917. (3,390)

HIPPERHOLME URBAN DISTRICT COUNCIL.

TARRED MACADAM.

The above Council invite Tenders for 2½-in. Tarred Macadam. Specification, Conditions, and Form of Tenders may be obtained at once from the Surveyor. Tenders must be received not later than first post on Tuesday, 1st May, 1917.

The lowest or any Tender will not necessarily be accepted.

G. WHARTON THOMPSON,
Engineer and Surveyor.

Council Offices,
Hipperholme.
April 19, 1917. (3,391)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. John S. Brodie, M.Inst.C.E., Borough Engineer and Surveyor, Blackpool.

METROPOLITAN DISTRICT.

A Metropolitan District meeting of the Institution of Municipal and County Engineers will be held at the offices of the institution on Friday next, the 27th inst.

Programme.

6.30 p.m.—Meet at the offices of the institution, 92 Victoria-street, S.W.

Business:

1. To confirm minutes of previous meeting.

2. To discuss paper by Mr. Reginald Brown, entitled "The Dustbins of Greater London (The Problems connected therewith and Suggestions for their Solution)."

All members of the institution are cordially invited to attend.

N. Scorgie,
Hon. District Secretary.

Hackney.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Edward Whitwell, F.I.S.E., M.S.A., Engineer and Surveyor, Abersychan Urban District Council.

GENERAL MEETING IN LONDON.

At a general meeting of the Institution of Municipal Engineers to be held in London on June 6th, Mr. Reginald Brown, M.Inst.C.E., engineer and surveyor to the Southall-Norwood Urban District Council, will present for discussion a paper entitled, "House Refuse: Its Calorific Value and its Possibilities."

The chair will be taken at 6.30 p.m.

London and Lancashire Fire Insurance Company.

At the fifty-fifth annual meeting, to be held at the Law Association Rooms, 14 Cook-street, Liverpool, on Wednesday next, the report, accounts and balance-sheet of this company for the year 1916 will be submitted. In the fire department the nett premiums amounted to £1,903,240, and the nett losses, paid and outstanding, to £937,348. The fire funds have been increased from £987,000 to £1,161,500, and the sum of £168,389 has been transferred to profit and loss account. The nett premiums in the marine department amounted to £489,133, and the nett losses, paid and outstanding, to £308,957. The marine funds have been increased from £244,030 to £346,000, and the sum of £75,993 has been transferred to profit and loss account. The nett premiums in the accident and general department amounted to £877,354, and the nett losses, paid and outstanding, to £549,191. The accident funds remain at £514,000, and the sum of £6,213 has been transferred to profit and loss account.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ROAD FOREMAN. April 21st. Stratford Urban District Council. £2 10s. per week.—Mr. G. H. Abrahams, clerk, Council Offices, Stretford, Lancs.

TRAMWAYS TRAFFIC SUPERINTENDENT. April 23rd.—London County Council. £500 to £700 a year.—The Clerk, London County Council, Spring-gardens, S.W.

ELECTRICAL ENGINEER.—April 23rd.—London County Council. £1,200 to £1,500 a year. The Clerk, London County Council, Spring-gardens, S.W.

MECHANICAL ENGINEER. April 23rd. Bolton Corporation Tramways and Electricity Committee. £500 a year. Mr. R. Mayor, town clerk.

GENERAL ASSISTANT.—April 24th.—West Suffolk County Council.—Mr. T. W. Morgan, acting county surveyor, County Surveyor's Office, Shire Hall, Bury St. Edmunds.

ASSISTANT IN BOROUGH SURVEYOR'S DEPARTMENT.—April 27th.—Chorley Town Council.—Mr. J. Mills, town clerk.

TEMPORARY ENGINEERING AND SURVEYING ASSISTANT.—April 28th.—Bootle Town Council. £2 10s. per week.—Mr. B. J. Wolfenden, borough engineer and surveyor, Town Hall, Bootle.

TEMPORARY SURVEYOR AND INSPECTOR.—April 30th.—Cheriton Urban District Council.—Mr. Arthur Atkinson, jun., acting clerk, Public Offices, Cheriton, Kent.

SURVEYOR AND INSPECTOR.—April 30th.—Luddendenfoot Urban District Council. £120 a year.—Mr. C. W. Moses, clerk, Council Offices, Luddendenfoot, Yorks.

INSPECTOR OF NUISANCES AND HIGHWAY SURVEYOR.—May 1st.—Skirlaugh Rural District Council.—Mr. C. W. Hobson, clerk, 26, Lairgate, Beverley, E. Yorks.

ASSISTANT INSPECTOR OF NUISANCES.— May 1st.—Barnes Urban District Council. £100 a year.—W. T. Goodale, clerk, Council House, Mortlake, S.W. (14).

MUNICIPAL ENGINEER.—May 1st.—Municipality of Lahore, India. £1,000—£1,600 per annum.—Mr. H. P. Tollinton, deputy commissioner and president, Municipal Committee, Lahore.

TRAMWAYS DEVELOPMENT SUPERINTENDENT.—May 7th.—London County Council. £500 to £800 a year.—The clerk, London County Council, Spring-gardens, S.W.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

READING. April 23rd. For the erection of new buildings and the repair and adaptation of part of the police buildings for the purpose of a chief maternity centre, for the corporation.—Mr. J. Bowen; borough engineer and surveyor, Town Hall.

RHONDDA.—April 26th.—For the erection of a mechanical filter house, for the urban district council.—Mr. J. B. Hughes, New Waterworks Office, Trehebert, Rhondda.

SCUNTHORPE.—April 28th.—For the supply of material and resetting of two beds of retorts, regenerators and flues, for the urban district council.—Mr. J. W. Turner, manager, The Gasworks, Scunthorpe, Lincs.

WOMBWELL.—May 1st.—For material and labour required in the resetting of a bed of retorts at the gasworks, for the gas committee.—Mr. P. D. Walmsley, engineer, The Gasworks, Wombwell, Yorks.

Engineering: Iron and Steel.

MANCHESTER. April 24th. For the supply of hard-drawn trolley wire, for the Tramways Committee.—Mr. J. M. McElroy, general manager, Corporation Tramways, 55, Piccadilly, Manchester.

HAMMERSMITH. April 25th. For the supply of induced draught fans, mechanical stoker, boiler feed pump, centrifugal pump for condenser water, and strainer for condenser cooling water, for the borough council.—Mr. G. G. Bell, organiser and manager, Electricity Department, 80, Fulham Palace-road, W. 6.

MANCHESTER.—April 25th.—For steelwork required in alterations to the boiler house at the Stuart-street generating station, for the electricity committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall.

Roads.

TENTERDEN. April 23rd.—For the supply of granite or other approved macadam, Kent Coalfield,

[illegible] Estate, and for painting, for the corporation. Mr. W. L. C. Turner, borough surveyor, Tenterden, Kent.

SANDGATE.—April 23rd.—For the supply of 9,000 cubic yards of 2½-in. to 3-in. granite, for the urban district council. Mr. H. Evans, surveyor, Council Offices, Hythe, Kent.

BENTLEY.—April 23rd.—For the supply of 2½-in. and [illegible] 2½-in. whinstone, and 2½-in. Bessemer slag for the urban district council. Mr. R. G. Whitley, engineer and surveyor, Council Offices, Bentley, Doncaster.

HADLEIGH.—April 24th.—For the supply of 250 tons of 1-in. and 3/4-in. granite, for the urban district council.—Mr. Harold W. F. Grimwade, clerk, Council Offices, Hadleigh, Suffolk.

BRAINTREE.—April 25th.—For the supply of 700 to 1,000 tons of granite, and for the use of a steam [illegible] and scarifier, for the urban district council.—Mr. H. H. Napkivell, surveyor, Vestry Hall, Braintree.

ASHFORD.—April 25th.—For the supply of 1,500 cubic yards of 2-in. granite or basalt, for the urban district council.—Mr. W. Terrill, surveyor, 5, North-street, Ashford.

HOYLAKE.—April 28th.—For the supply of kerbs, channels, setts, cement concrete flags, macadam, chippings and Portland cement, for the urban district council.—The Engineer and Surveyor, Town Hall, Hoylake, Cheshire.

BATTERSEA.—April 30th.—For the supply of materials and works for resurfacing a roadway with asphalt macadam, for the borough council.—Mr. W. M. Wilkins, town clerk, Battersea, London, S.W.

CRAMLINGTON.—May 5th.—For the supply of broken whinstone, tarred slag, slag chips, hire of 15-ton roller, and tar-spraying, for the urban district council.—Mr. W. J. Coulson, Council Offices, Cramlington.

Sanitary.

STIRLINGSHIRE.—April 25th.—For scavenging and cleansing certain special districts, for the Eastern District Committee.—Mr. J. H. Burns, district clerk, District Offices, Falkirk.

HOYLAKE.—April 28th.—For supply of stoneware sewer pipes, for the urban district council.—The Engineer and Surveyor, Town Hall, Hoylake, Cheshire.

GODSTONE.—May 9th.—For certain supplementary works for sewage disposal to be carried out at the council's existing outfall works at Limpsfield and Oxted, for the rural district council.—Mr. H. Howard Humphreys, 28, Victoria-street, Westminster, S.W.

Miscellaneous.

BRIGHTON.—May 10th.—For the supply of Portland cement, for the corporation.—Borough Surveyor, Town Hall.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ALDERSHOT.—For the supply of 430 tons of slag tarmac, 250 tons of 2-in. Dressa or Welsh basalt, and 14,000 gallons of distillate tar, for the urban district council.—Mr. F. C. Urmston, surveyor, Municipal Buildings, Aldershot.

GRANITE.

	Per ton
[illegible]	16 17
[illegible]	16
[illegible]	19
[illegible]	22

TAR MACADAM.

[illegible]	19 20
[illegible]	19

TAR.

	Per gallon
	d.
[illegible]	1½
[illegible]	1
[illegible] only	2½

[illegible] quote for delivery free to [illegible]

GRIMSBY.—For [illegible] for the town council.—Mr. H. [illegible], engineer and surveyor.

	£
[illegible]	431
[illegible]	497
[illegible]	415
[illegible]	421
[illegible]	427

HEBBURN.—For tar-spraying the district roads, for the urban district council.—Mr. H. Lee, jun., deputy surveyor, Council Offices, Argyle-street, Hebburn.

	Per yard.
	d.
Brotherton & Co., Limited	1¼
H. V. Smith	1¼
Taroads, Limited	1 3-10

RHONDDA.—For the supply of house service single-phase and three-phase meters, for the Electricity Committee.—Mr. J. M. Bowman, electrical engineer, Electricity Works, Porth, Glam.

British Westinghouse Electric and Manufacturing Company, Limited, Manchester.
Ferranti, Limited, Hollingwood.
Chamberlain & Hookham, Limited, Birmingham.
Bat Meter Company, Limited.
British Insulated & H. Cables, Prescot.
General Electric Company, Limited, London.
Landis & Gyr, Limited, London.
Electrical Apparatus Company, Limited, London.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

APRIL.

20.—Institution of Mechanical Engineers: Mr. Michael Longridge delivers his presidential address. 6 p.m.
20.—Town Planning Institute: Mr. Rees Jeffreys on "Road Construction and Improvements by Means of Town Planning Schemes."
27.—Institution of Municipal and County Engineers: Metropolitan District Meeting. 92 Victoria-street, S.W. 6.30 p.m.

MAY.

2.—Institution of Civil Engineers: Sir James Wolfe Barry on "The Standardisation of Engineering Materials and its Influence on the Trade and Prosperity of the Country" ("James Forrest" Lecture). 5.30 p.m.
8.—Royal Sanitary Institute: Mr. C. H. Cooper, borough engineer and surveyor of Wimbledon, on "Refuse Collection and Disposal." 6 p.m.
17.—Institution of Electrical Engineers: Annual General Meeting. Institution of Civil Engineers, Great George-street, Westminster.

JUNE.

6.—Institution of Municipal Engineers: General Meeting in London, Mr. Reginald Brown, M.INST.C.E., on "House Refuse: Its Calorific Value and its Possibilities." 6.30 p.m.
21-22.—Incorporated Municipal Electrical Association: Annual Meeting, Institution of Civil Engineers, Great George-street, S.W.

APPOINTMENTS OPEN.

CHERITON URBAN DISTRICT COUNCIL.

APPOINTMENT (TEMPORARY) OF SURVEYOR AND INSPECTOR OF NUISANCES.

The Urban District Council of Cheriton invite applications from gentlemen willing to act during the war as Surveyor and Inspector of Nuisances, subject (as to the latter office) to the approval of the Local Government Board.

Applicants (who will understand that they are asked to take the place of the official who is away on military service) must be ineligible for military service. They must have efficient knowledge of sanitary matters and sewerage works, and be fully competent to carry out the duties usually appertaining to the respective offices, including those of a Hackney Carriage Inspector, and those specified in any By-laws in force within the Urban District, and also the duties under the Dairies, Cowsheds and Milkshops Order, the Factories and Workshops Act, the Housing and Town Planning Act, and the duties of Petroleum Inspector, &c.

The area of the district is about 1,179 acres, with about 5 miles of roads, and a population of 7,577. The main roads are not under the Council's jurisdiction.

Applicants must be prepared to spend their whole time, if appointed, in the duties of their office. Private practice might be allowed with special leave of the Council. The successful candidate will be required to give the usual bond, the premium on which will be paid by the Council, and to enter into a written agreement with the Council.

Applications (endorsed "Surveyor"), stating age, experience, and salary required, with copies of not less than three recent testimonials (which will not be returned as to character and competency, must be made in candidate's own handwriting, and sent so as to reach the undersigned not later than the 30th day of April, 1917.

Canvassing Members of the Council will disqualify.

(By order of the Council)
ARTHUR ATKINSON, JUNR.,
Acting Clerk.

Public Offices,
Cheriton,
Kent. (3,386)

The Surveyor

And Municipal and County Engineer.

Vol. LI. APRIL 27, 1917. No. 1,319.

Minutes of Proceedings.

Wayleaves for Electric Mains.

At their last meeting the Institution of Electrical Engineers discussed the question of securing facilities by legislation for carrying electric mains over private land, a matter which is of great importance to suppliers of electricity, and which has assumed especial prominence in view of the strong movement, fostered by the Board of Trade, towards linking-up electricity works in adjoining areas in order to economise in fuel consumption. So far as private property is concerned, the surveyor is not usually interested in the subject; but crossing fields necessarily implies crossing public roads also, and in this connection it may be worth while to outline the rights of local authorities responsible for the maintenance of the roads, as the surveyor may be called upon to advise his council with regard to proposals put forward for the erection of cross-country mains. In the first place, it is necessary to distinguish between two classes of suppliers of electricity—namely, statutory and non-statutory undertakings. The former carry on their business under the sanction of Special Acts of Parliament, or of Provisional Orders granted by the Board of Trade, and subsequently confirmed by Parliament; their position *vis-à-vis* the local authorities is clearly defined in the various Electric Lighting Acts, and is in some respects distinctly inferior to that of the latter class, in that they are compelled to obtain the consent of the road authority before they can carry their mains over any public road. They must also obtain permission from the Board of Trade, and comply with the technical requirements of the board, to ensure the safety of the public.

While each case must necessarily be judged upon its merits, the fact that the undertaking has received Parliamentary recognition as a branch of public service will naturally carry weight with the local authority, and, as a rule, no obstacle is placed in the way of the applicant for permission; but exceptions are on record, and it is within the power of the local authority to impose an absolute veto on such a proposal, without assigning any reason for so doing. Only in the case of "power companies" is an appeal allowed to the Board of Trade, and then only if the local authority concerned is a rural district council; in such a case the board can override the council's veto if consent is "unreasonably withheld." Turning to the second category—non-statutory undertakings—these exist by virtue of the fact that, up to 1899, any person or firm, without obtaining Parliamentary powers, was at liberty to supply electrical energy to anyone if so disposed; since that date no person may embark upon the sale of electricity within an area where there exists an authorised undertaker, unless such sale is subsidiary to his normal avocation, as in the case of a power user who generates his own supply of energy and has a surplus which he may sell to the public. Where there is no authorised supplier the field is still open to private unauthorised suppliers. It is a singular fact that such concerns are free from the necessity of obtaining the consent of local authorities in respect of crossing public thoroughfares, the only restriction imposed upon them being the requirement that their overhead lines must be so erected as to comply with the regulations of the Board of Trade. They must, of course, negotiate wayleaves with the owners of land crossed by their mains, and where the local authority owns such land, or owns the "fee simple" of a roadway, it is in a position to veto the erection of mains over its property, or to demand a rental for the accommodation. The local authority, it is true, may adopt special by-laws covering the use of overhead mains in its area, but such by-laws have to be approved by the Board of Trade, which has issued a model form for the purpose; and there is hardly a single instance in which this course has been followed.

The discussion at the meeting referred to showed a unanimous desire on the part of electrical engineers to get rid of the local authority's veto where it exists, by the institution of an appeal to the Board of Trade, and to deprive the local authority of all powers of interference with technical considerations, such as the design of the line and questions of public safety, which are regarded as matters rightly falling within the province of the Board of Trade alone. The question of obtaining compulsory powers for carrying mains over private land and securing the right to refer the settlement of fair terms of rental to arbitration, in order to put an end to extortionate demands on the part of landowners, affects the local authority only in the event of its being either itself the supplier of electricity or the owner of land on the route of the mains. This was the principal subject dealt with in the discussion, and it was generally agreed that authorised electricity supply undertakers ought to possess some such powers as those granted last year to the Postmaster-General in respect of telegraph and telephone lines. The matter is of very considerable importance, in view of the acknowledged value of a supply of electricity to the community, which has been abundantly demonstrated during the war, especially in connection with the supply of power to munition factories; extraordinary developments have taken place, and it is now generally agreed that the supply of electricity at cheap rates to indus-

try, including agriculture, as well as for lighting and power purposes of all kinds, is a fundamental necessity to the maintenance of the national prosperity after the war. It may safely be concluded therefore that no public authority will place gratuitous obstacles in the path of a *bonâ fide* proposition involving the provision of a supply to its constituents, which often, especially in sparsely populated districts, cannot possibly be accomplished on a commercial basis except by means of overhead lines. It rests with the surveyor, however, to scrutinise carefully all such proposals emanating from companies operating in his district, and to see that the rights and privileges of the community are duly respected and conserved.

* * *

The Safety First Campaign.

The council which was appointed on the initiation of this movement has not been long in getting to work, as is evidenced by the report presented at their third meeting on the 18th inst. The Street Dangers Committee reported that they had circularised all the local authorities of Greater London on the question of the reversal of the rule of pedestrians keeping to the right on footpaths. The same committee dealt in detail with the provision of more street refuges, temporary or permanent, and offered some excellent suggestions as to their construction. They also recommended "that street lamp columns should be placed as near as possible to the corners of streets, but not nearer than 2 ft. of the kerb where the width of path permits." This suggestion met with some opposition, as it was argued that if so placed there would be room between the lamp column and the edge of the kerb for pedestrians to walk, thus inviting a dangerous practice. It was pointed out also that the columns, if so placed, would add to the already large number of obstructions, such as sand bins, pillar boxes, tramway poles, and so forth. There is no doubt some truth in these arguments, but the reason given for suggesting this distance from the kerb was that it was desired to reduce the risk of damage to columns by the overhang of carts, drags, lorries, and so on. Some exceedingly useful and practical suggestions were made with regard to the lighting of temporary barricades, &c., at night, so that drivers would not be deceived as to their width or position, as now so frequently happens. The question of snow cleansing was also dealt with, but it is rather late in the season for that, and the recommendations appeared rather on the lines of locking the stable door after the steed has been stolen. Some valuable suggestions were made as to the whitening of the kerbs, and the use of spent carbide of calcium was recommended. Some criticism as to the whitening of kerbs was raised by a member of the council on the ground that pedestrians would always put their feet on the whitened kerb, and thus tend to rub off the material. He evidently did not realise that they do this simply because they know it is the step off into the road, and that any prudent person would place a foot there before advancing the other foot. The various recommendations and suggestions are to be sent to the local authorities in the Greater London area in due course.

The Lighting Sub-Committee also presented a report which was full of excellent suggestions. They approved of the present system of leaving the upper one-third of the glass of street lamps completely unpainted, but coating the lower two-thirds with a specially prepared whitewash. The result of this treatment of the lanterns is that the light is more uniformly distributed, the deep shadows are eliminated, and the bright patches under the lamp are done away with, and it is a method of light diffusion which might be followed with advantage after the war. This sub-committee also drew attention to the want of distinction at night between main and subsidiary thoroughfares, and recommended that there should be distinguishing signs on the lanterns near these corners as an indication to drivers of the class of street they are in, and are approaching. Incidentally, this might be the means of preventing much of the present noisy and disturbing hooting. In cases where the illumination in side streets is noticeably less than in main streets, the transition from lightness to comparative darkness at busy junctions leads to confusion, and sometimes accidents. To obviate this it was suggested that the change might be made gradual by increasing the candle-power of the lamps in the side streets as the main roads are approached. This is an obvious improvement, which should be carried out even after the war, as anyone who has driven a car out of light rather suddenly into comparative darkness will agree. Suggestions on various other points were made in the course of the proceedings, but the matters we have touched upon are sufficient to show that the council do not intend to let the grass grow under their feet, and are determined to leave nothing undone to achieve the reforms they have in view. Their example of practical "push" is, we cannot help thinking, one that some of our numerous Government Departments might do well to emulate.

* * *

Arterial Roads—Town Planning.

The paper in which Mr. Rees Jeffreys at the last meeting of the Town Planning Institute examined the deficiencies in the existing machinery of local government which delay and render difficult the solution of the twin problems of housing and road transport was of exceptional interest. The paper virtually consisted of an exhaustive inquiry into the possibility of building and improving roads of more than local importance by using the powers given to local authorities by the Town Planning Act. Apart from this method of solving the very serious problem of arterial road communication, there would appear to be but little hope of improving the present situation by any other means. It will be remembered, indeed, that towards the end of last year Mr. Long, who was at that time President of the Local Government Board, told an influential deputation which waited upon him that there was no immediate prospect of obtaining money from public funds for the purpose of arterial road construction. He very properly pointed out that there are at present other public needs, and that, upon the conclusion of the war, the first call upon Government funds ought to be for the provision of housing accommodation, and for sanitation and water supply. The same tone was adopted by the Road Board in their last annual report, so that Mr. Rees Jeffreys' inquiry as to the possibility of dealing with the problem by means of the Town Planning Act is at the present time very pertinent.

Urgent as the question is even now, there is little doubt that it will be more urgent after the war, when there will be a great expansion of mechanical traffic on the roads, not only for private purposes, but also for the carriage of passengers and goods. In the first part of his paper Mr. Jeffreys dealt at some length with the legal position in regard to the matter with reference to the specific provisions of the Town Planning Act. Hitherto, so far as we are aware, no town-planning scheme, either proposed or approved, has been confined in its operations to road construction only. Mr. Jeffreys' opinion, however, which is entitled to the fullest respect, is that the Local Government Board have absolute discre-

tion as to what may or may not be included in a town-planning scheme. Up to the present the board, as is their way, have not expressed any official opinion as to whether a proposal to make a town-planning scheme which provides only for a main road and its connections with the existing roads would be considered by them. In view of the importance and urgency of the question, however, it is earnestly to be hoped that the board will give a lead to local authorities in the matter. Some indication of their view is afforded by certain observations which appeared in their last annual report. It was there stated in terms that it is unlikely that any scheme can be entirely complete in itself, and that it is probably best to recognise this and to trust to subsequent schemes for filling in details when the necessity becomes apparent. The second part of the paper consisted of an examination of the five town-planning schemes that have been approved up to the present time, with special reference to the financial obligations as regards roads imposed by them on local authorities. The investigation showed that it was impossible to determine precise results, but that the machinery of the Town Planning Act enables roads to be constructed or widened at a less cost to the local authorities than by any other procedure. In this connection the observations of Mr. Stilgoe in regard to the Birmingham scheme are of great interest. With regard to the cost of laying out and constructing new main roads, or widening existing roads, under the Town Planning Act as against similar work carried out under Public Health and Highway Acts, or Special Acts of Parliament, he says that there is no doubt that procedure under the Town Planning Act is the more economical from a public point of view, and is more just, because under the Town Planning Act a local authority can get power to charge the frontager with some portion of the cost, inasmuch as the Act provides for the charging of betterment against owners who derive benefit from the scheme. Considerations of space prevent us from dealing with the remainder of the paper this week, but we hope to return to the subject in our next issue.

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The Germans and British War-roads.

It is well, and to an extent consoling, to learn about ourselves from the enemy, though it is always wise to refrain from being flattered by what we learn from such a quarter, for it may be taken for granted that if he awards credit it is done for some ulterior motive of his own, and, in fact, extracted from him rather than given freely or with a whole heart. The German newspaper comments upon the British offensive have covered a wide field of what may be termed excusatory licence. Many of these are ingenious, and not a few acute and far-seeing, but all of them had the same self-satisfying climax, with the name of the demigod Hindenburg figuring larger than life. It has been reserved for the *Vossische Zeitung* to make the discovery, and to give it to the world by way of complaint, that the British superiority in their recent offensives is merely "mechanical." The term is used contemptuously, of course, but all the same the writer can hardly refrain from what appears to be a flash of sincerity when he comes to deal with the British genius for road and light railway construction. "The English spirit of organisation," he says, "has been the main factor in promoting the extraordinary construction of the system of roads behind the Anglo-French front, and in completing the system in a fashion which we are compelled to admire. From the reports from abroad we see that only the brilliantly constructed system of roads, canals, and especially of railways and light railways, has made possible the rapid moving about of the masses of artillery that are absolutely necessary for the attack. In this matter our enemies are in a certain sense superior to us, thanks to the American support which is now publicly advertised by Lloyd George, but which has really been given since the beginning of the war. This manner of warfare lacks all that is intellectual. It is the mechanical solution of a mechanical question." What follows is cast in the approved form of Germanic disingenuousness, for which the writer may be pardoned if only because he has cast a fitful ray of light upon the stupendous task which British road engineers and British road makers are carrying through behind the battle front in France.

* *

Forms for Statistics.

The Standardisation Committee of the Institution of Municipal and County Engineers have performed a very useful task in preparing certain standardised forms so that municipal engineers may have an opportunity of preparing statistical data on a well-considered and uniform basis. Certain of these forms have recently been published, and it is earnestly to be hoped that more will be forthcoming at an early date. The value of statistical information when it is prepared on a uniform basis is at least doubled, and members of the institution who have occasion to collect and collate information upon any topic would be well advised to use the standard form if an appropriate one is in existence. In issuing these forms the institution make a further announcement of great interest and importance. It appears that it is the intention of the council, as soon as practicable, to arrange for the establishment of a Statistical Information Bureau at the headquarters of the institution, so that the trouble to engineers in making inquiries by circular, and in replying to such inquiries, will be entirely avoided. All that will be necessary if an engineer requires particulars from other districts in regard to any matter of practice will be for him to visit the institution, where he will be able to obtain the attention which he requires, or to write to the secretary for a copy of the latest tabulated information. It will, of course, be some time before the institution will itself have obtained complete information in regard to the many questions with which municipal engineers have to deal, but the scheme appears to us to be a most attractive one, and in endeavouring to carry it out it is to be hoped that the council will have the cordial co-operation of all the members.

* * *

Extraordinary Traffic.

According to the official Gazette of the County Council Association, it has been calculated that the damages awarded to the Abingdon Rural District Council as a result of its recent action against the Oxford Electric Tramways, Limited, represent, on the mileage run by the motor vehicles, 3½d. per car-mile. On the question of extraordinary traffic caused by the haulage of materials to and from a munition factory, it is of interest to notice that the Hertfordshire County Council have decided to enter into an arrangement in regard to a company manufacturing munitions, by which the damage done to a road formerly used by the company, but now abandoned, will be paid for by the company and the Ministry of Munitions in equal shares, and for the road now being used there will be a joint payment (to be retrospective) by the company and the Department of 3d. per ton per mile for all materials carried from April 1st to October 31st inclusive, and 1s. per ton per mile for all materials carried from November 1st to March 31st inclusive.

Road Construction and Improvement by Means of Town Planning Schemes.*

By W. REES JEFFREYS.

[An examination revealing deficiencies in the machinery of local government which delay and render difficult the solution of the twin problems of housing and road transport—and a consideration of some modest remedies.]

This is an inquiry into the possibility of building and improving roads of more than local importance under the provisions of the Town Planning Act.

The construction of "through," "main," or "arterial" roads as separate undertakings under Public or Private Acts of Parliament is so costly that many persons in authority regard it as financially impracticable to undertake road construction at the cost of public funds on any large scale. . . . It is expedient therefore to inquire whether it is practicable to build through roads without any large expenditure of public money—(1) Under existing town planning powers; (2) with additional powers, and, if so, what powers that Parliament would be likely to grant.

I assume, as matters of general agreement, that—(1) There will be after the war a great expansion of self-propelled traffic on the roads, not only for private purposes, buth also for the carriage of passengers and goods, and (2) a large number of new houses (particularly less expensive dwellings) will be erected in many parts of the country, partly at the cost of public funds. I assume, further, as agreed matters of public policy, that—(1) The roads should be adapted and constructed to carry the increased traffic; and (2) the dwellings should be erected as far as possible in healthy areas, having due regard to proximity to or accessibility from the scene of the daily labour of their occupants.

The improvement of roads and the construction of new dwellings are limited by financial considerations. So far as the roads are concerned, the strengthening and improvement of existing roads to carry the increased traffic will absorb, and probably more than absorb, the whole of the money which the local highway authorities and the State will be prepared to devote to this service, having regard to (*a*) the competing claims of other services, and (*b*) the total sum that it will be possible practically to raise in taxation. If this is the case, the construction of new roads in the future, as in the past, will have to depend almost entirely on private initiative and private capital, with such small assistance (which may, in total, be practically negligible) as the public authorities can squeeze out of their revenues—revenues which, as we have seen, are earmarked for the maintenance and improvement of existing roads.

Road Building by Private Enterprise.

Private enterprise appears to have added during recent years an average of 332 miles of road and streets per annum to the total mileage of public roads maintained by local authorities in England and Wales. These are the roads and streets laid out according to the ideas of individual landowners and others interested in estate development. They have served as tributaries to the existing arterial roads.

One of the questions for consideration is whether it is possible to provide by town planning schemes that this annual additional mileage built by private enterprise shall be laid out under public control, so as to provide alternative and relief thoroughfares to the existing arterial roads.

In what areas has the additional mileage of new road and streets been built? In the absence of exact statistics I am disposed to think that the greatest increase in the mileage of streets is in and near the great industrial centres such as London, Manchester, Glasgow, Birmingham, Coventry, and Leeds. It is in these areas that the congestion of traffic and the need for direct and circular roads is the greatest. It is not possible to predict that [illegible] will not supply the necessary money, to use the machinery of the Town Planning Act to secure that [illegible] all of the 330 miles of roads built annually by private capital shall be so laid out as to serve as "[illegible] communication roads," relieving congestion instead of "tributary roads" increasing it?

The question may be put in another way—Is it possible to lay down arterial roads by means of town planning schemes in order that they may be built by private enterprise? Before an affirmative answer can be given, those who have some knowledge of the difficulties of the subject will require to be satisfied on the following points:—

(1) Can the machinery of the Town Planning Acts be used to secure the sites for arterial roads in advance of building development?

(2) If the answer to question (1) is in the affirmative, what financial obligations will be imposed on the town planning authorities?

(3) As a road to be useful as an "arterial" or "through" road will require in many cases to pass through the areas of several authorities, can these authorities be induced or made to work together?

(4) As nearly all arterial roads require special works—*e.g.*, bridges over railways and rivers—for which the landowner cannot be reasonably expected to pay, where is the money coming from to pay for these works?

Can the L.G.B. Approve Single Road Schemes?

The question raised in (1) is whether, under the Town Planning Act, a local authority may propose a town planning scheme and the Local Government Board approve it when that town planning scheme provides only for the location of a single road. . . .

Sec. 54 of the Housing and Town Planning Act provides "that a town planning scheme may be made . . . as respects any land . . . likely to be used for building purposes with the object of securing . . . convenience in connection with the laying out and use of the land and of any neighbouring lands."

The laying out of an "arterial," "important," or "backbone" road would appear to be covered by this section.

The Act does not define a town planning scheme, or give any mandatory directions as to what shall be included in such a scheme. The Fourth Schedule to the Act does specify a number of things which may be dealt with by general provisions prescribed by the Local Government Board. The board have not prescribed any general provisions, and have left it to each authority to deal with the matters referred to in the Schedule in their respective draft orders, and have not, so far, insisted that any or all of them shall be provided for. My conclusion is that the Local Government Board has an absolute discretion as to what must be included to constitute a town planning scheme.

The Local Government Board have not expressed any official opinion, so far as I am aware, as to whether a proposal to make a town planning scheme, which provides only for one "backbone" road and its connections with existing roads, would be considered by them. We have for guidance the Order made by the board on February 11, 1914, giving directions as to the procedure, and the observations of the board in their annual reports. The terms of that Order show that the Local Government Board had in mind a scheme which would provide for the many matters which would be included necessarily if the scheme related to an area which might be expected to be built over rapidly. But there is nothing in these regulations which exclude the possibility of dealing with an area in which development is likely to be slow, but through which it may be desirable to lay down without delay a "backbone" road, leaving all the other details to be dealt with by future town plans.

I assume therefore that if Willesden, Sutton, or Surbiton, or any other authority similarly circumstanced, were to schedule a convenient area of land and ask for authority to prepare a town planning scheme for that area, and the prepared scheme showed only the location of the "backbone" road through the scheduled area (and the necessary connections with the existing roads), the Local Government Board would consider and deal with such an application and draft order on their merits, and not

* Paper read at a meeting of the Town Planning Institute held on Friday last.

refuse to consider them on the technical ground that such a scheme was outside the scope of, or did not comply with, the provisions of the Town Planning Act. By a convenient area of land is meant the area on both sides of the road which would be served by the "backbone" road. It might be a mile on both sides—it might be half a mile. It might be a mile in some places and half a mile in another. The configuration of the land and the proximity of the parallel arterial roads on either side will determine the "convenient area."

I assume, further, that if Willesden, Sutton, or Surbiton find that the road, in order to fulfil its function as a "backbone" road, must be continued through or into the district of the adjoining authority, and are unable to induce that authority to co-operate with them, an application from Willesden, Sutton, or Surbiton for authority to town plan the area affected within the district of the adjoining authority would be a competent application, and would be dealt with by the board on its merits.

FINANCIAL OBLIGATIONS OF LOCAL AUTHORITIES UNDER TOWN-PLANNING SCHEMES.

We come to the second difficulty which arises now that question (1) has been answered in the affirmative. What financial obligations would be imposed upon a town planning authority if it proposed a town-planning scheme which provides only for the laying down of the main lines of communication, possibly only a single road. Few things frighten a public authority so much as an unknown liability. It is the element of the unknown in connection with town-planning schemes which is another principal cause of the slow progress that has been made in town planning. To place an arterial road implies an obligation to construct at some date or other upon somebody. The local authorities are afraid that that obligation will finally devolve upon them, if not for all, for some portion of the road, and that is an obligation which they are not, as a rule, prepared to undertake. . . .

An examination of Town Planning Orders so far sanctioned shows that the machinery of the Town Planning Act enables roads to be constructed or widened at a less cost to the local authority than by any other procedure, but it does not enable us to fix the limits of the financial obligations imposed upon local authorities. These cannot be stated in general terms. The answer to Question 2, therefore, is that new road construction under the Town Planning Act does impose financial obligations upon local authorities the amount of which, although less than the cost of construction by other machinery, depends upon the circumstances of each scheme, and also upon the manner in which each scheme is handled. The figures for the Ruislip-Northwood scheme are very encouraging, and show that if town planning is intelligently handled a great deal may be accomplished for a very small expenditure.

Questions 3 and 4 are directed to the possibility of adapting the machinery of the Town Planning Act to the construction of roads of an arterial character. The experience so far obtained does not take us very far in answering these questions. All the orders so far made relate to areas within the jurisdiction of single authorities. Having regard, however, to the limited area under the control of a single authority, an arterial road must of necessity pass through the area of several authorities. Birmingham is the only authority that so far has made any considerable provision for arterial road construction, but Birmingham is an exceptionally large area. Very few urban authorities control so much undeveloped land as Birmingham. If they did, and large centres of population were made responsible for developing the suburban and agricultural area within, say, ten miles of their built-on area, much of the difficulty with regard to town planning and the construction and widening of roads might disappear.

ROADS PASSING THROUGH AREAS OF SEVERAL AUTHORITIES.

The next step in this investigation concerns the possibility of constructing new roads and widening existing roads passing through the areas of several authorities. We have to answer Questions 3 and 4, which deal with the difficulty of inducing adjoining local authorities to co-operate and the provision of the cost of special works. . . . .

It is unreasonable to expect that three small authorities with limited financial resources would undertake a liability of a quarter of a million, the benefit of which, they would probably argue, is not for local traffic. The fear that they may be called upon to contribute may operate to prevent them encouraging a scheme which, apart from the financial obligations involved, might be welcome.

What are the possibilities of construction under town planning schemes?

Construction under a town planning scheme demands local initiative. The proposed road passes through the area of three local authorities. It is possible, therefore, to have the following conditions:—(1) That all three authorities are hostile or indifferent to the proposal; (2) That two authorities are favourable and the other is hostile or indifferent; (3) That one authority is favourable and the other two hostile or indifferent.

It is clear that under condition (1) nothing can be done; under conditions (2) or (3) something may be attempted. For the purpose of investigation, let us assume condition (3) and explore what could or might happen. In this case, it must be assumed that the road, to serve its purpose, must be provided for from end to end. It would be no good for the "favourable" authority to provide for its section and leave to time and chance the hope that the two "unfavourable" authorities may complete their sections. The "favourable" authority would have a road with neither beginning nor end, and private building might for ever prevent its completion.

The "favourable" authority would, therefore, have to apply for powers to the Local Government Board to town plan for the purposes of this road, not only the land affected in its own area, but also in that of the other authorities. Those familiar with the conditions under which local government is carried on know that the mere fact of one authority seeking jurisdiction in the area of another would, as a matter of course, arouse the jealousy and the opposition of the other authority. Why should the "favourable" authority arouse local trouble for a public object which is not absolutely essential to its own well-being? This condition alone will stop in most cases any progress being made.

THE LIABILITY TO CONSTRUCT.

In the approved schemes which we have considered, provision have been inserted enabling the local authority to construct roads in anticipation of building development, but the owners of the property cannot be called to contribute their share of the cost of the road until they let or sell their land for building purposes. It is an advance on any previous procedure, but it leaves the town planning authority under the obligation of providing some or all of the capital required for the original construction. Further, the local authority loses the interest on the capital provided for the period between the date of the construction and the date that the owner chooses to let or sell for building purposes, and as this date depends purely upon private considerations it may be a long period.

The proportion of the total length which the local authority might be called upon to build in advance of building development will probably be greater in the case of arterial or backbone roads than in local or residential roads. This condition may present a serious obstacle to local authorities planning out arterial roads.

Is it reasonable to propose that land for a backbone road shall be sterilised without imposing upon the local authority the obligation to construct? Some landowners may object to such a proposal on the ground that it will handicap them in the development of their estates. They can say: "If we know this road is to be built, we will plan out our estates accordingly, but if we have no guarantee that it will be built within a reasonable period we shall have to develop our estates in quite a different way, so that access may be given to them from existing roads. The difficulty seems an almost insuperable one, and I shall be glad of suggestions for its solution. I confess that I see none which will completely meet it. The following may tend to mitigate it. The line of the arterial road may be laid down under a town planning scheme without imposing any obligation to build upon the local authority and the land required for the road sterilised for a definite period of years, say, five, seven, or ten. During that period it might be open to any landowner affected to show cause for varying the line of the road, and so long as through connections are given such variations should be accepted, if the local authority is not prepared to undertake any financial responsibilities for the con-

struction of the road on the line proposed in the plan.

At the end of the period fixed in the Order the scheme would come up for reconsideration and dealt with as the equities of the situation demand. If the local authority is then not able or willing to give an undertaking to advance the money to build such sections of the road as are necessary to give access to the property of the owner who is anxious to develop, then the sterilisation would lapse. In most cases, one might reasonably expect that in that fifteen years the development would be such that the local authority would have less difficulty in undertaking the financial obligation to complete any section necessary to get through communication than at the time when the scheme was first initiated.

FUNDS FOR SPECIAL WORKS.

There remains the question of the provision of funds for the special works. Quite frankly I do not think minor local authorities, except in very exceptional circumstances, will undertake the provision of these funds. The cost of the special works is the second great difficulty to be overcome, if arterial or backbone roads are to be laid down by town planning machinery under our existing system of local administration of important highways. Unless the State provides these funds the roads will not be built. But the cost of special works represents but a small proportion of the total cost, and, in asking the State to undertake this liability, the local authorities would be asking for a more definite and limited concession than the alternative request that the State should undertake the entire responsibility for the provision of arterial roads.

But the greatest need of all is yet to be referred to. Where shall we look for the driving force, the negotiating ability, and the administrative capacity to carry through a scheme of this kind? Under present conditions there is no inducement for men possessing or controlling these valuable qualities to undertake to promote arterial road schemes.

NEW ROADS CONNECTING COUNTY BOROUGHS.

New roads connecting county boroughs present another set of difficulties. The Local Government Act of 1888 was a great legislative effort, but it had one outstanding weakness. It cut off the great centres of population for the purposes of local government and local taxation from the country districts that surrounded them. It tended to divorce the country from the town. Great towns like Nottingham and Derby are separated from the social unit of which they are the natural nerve centres. The rich industrial districts are relieved from the obligation to assist financially and otherwise the development of the country districts that surround them. A frightful crop of new jealousies resulted, and new obstacles were created to necessary readjustments in the social organism. Evidences of it are seen in the refusal of the towns to help the outside areas except on the condition that they come within their jurisdiction; and in the fierce resistance that is offered by the principal authorities in the outside areas—*i.e.*, the county councils—to proposals of the towns to take from their jurisdiction their richest areas. . . . However desirable the scheme may be, however great may be the benefits that a road may confer upon the general public, I fail to see how, by any practical arrangement under the existing system of rating, it is possible to reconcile the interests of the county and the county boroughs. This divided interest will probably be fatal to the construction of a first-class road, either as a special scheme or under the Town Planning Act, especially as there is no authority charged with the duty of reconciling these divided interests—and no individual would be rewarded if he succeeded in doing so.

WIDENING IMPORTANT ROADS THROUGH RURAL AREAS.

The fourth class of works to which it may be desirable to apply town planning machinery is the widening of important roads. Anyone who has cycled or motored over the principal roads in England for the last thirty years cannot but have had his feelings outraged on many occasions when he has noticed fresh buildings erected at the side of important but narrow roads, sometimes without any footpaths at all being provided and at others only a narrow and inadequate strip of two or three feet. The county councils, who are the principal main road authorities in rural areas, have no powers to prescribe building lines, to fix a minimum width for a main road, or to utilise the powers of the Town Planning Act. Is this limitation of the county council's authority in the public interest? . . . It seems that the widening of country roads under the Town Planning Act on any extensive scale must remain in abeyance until the county councils are given powers which will enable them to avail themselves of the machinery of the Act.

SUMMARY OF NEEDS AND DIFFICULTIES.

The examination of four typical schemes of road construction and improvement shows that it is quite legally possible to use the machinery of town planning for the purpose of arterial road construction and improvement, especially if the county councils are given enlarged powers to use that machinery with the public health authorities. The examination also shows that, from a practical point of view, there are three outstanding difficulties which prevent the machinery of town planning being largely used for purposes of arterial road construction and improvement. These difficulties are:—

(1) The absence of any inducement for men with the necessary qualifications—imagination, driving power and negotiating ability to initiate and carry through schemes of road construction and improvement under the Town Planning Act, and of any organisation for training and employing such men.

(2) The financial obligations imposed upon the authorities, particularly the provision of the cost of special works and of the cost of construction in advance of building development.

(3) The divided interests of adjoining authorities, and particularly the sharp division of interests between administrative counties and county boroughs.

These are the difficulties which face all those engaged in planning and constructive work—how can the money be found and used, and how can the opposition of conflicting interests be allayed and overcome?

The present paper suggests the following suggestions may be considered:—

(1) *The Machinery.*—Formation of an official or semi-official organisation attached to the Local Government Board for the training and employment of engineers and surveyors, whose members shall be available for employment by local authorities, the organisation to be authorised and encouraged to undertake pioneer work and promote schemes on which their members shall afterwards be constructively employed.

(2) *The Money.*—The cost of special works and expenditure over and above what can properly be fairly charged to the landowner and the local authority to be paid by the State. (The alternative is to enlarge the rating areas so that the county boroughs and the administrative counties are made one rating unit for the construction and maintenance of arterial roads.)

(3) *Divided Local Interests.*—The establishment of a Permanent Commission on the "Powers and Boundaries of Local Authorities," which shall, after due inquiry and negotiation with all interests concerned, propose to the Local Government Board such alterations and adjustments in the duties, powers, and areas of particular local authorities as special local conditions and changing circumstances appear to require. Such proposals, if approved by the Local Government Board, with or without alteration, shall be embodied in a Provisional Order, and, subject to the usual formalities, become law.

ORGANISATION AND USE OF TOWN PLANNING ENERGY.

These suggestions may be considered in order—

(1) When the Town Planning Act was under consideration it was pointed out by many speakers in the House of Commons that to secure town planning on a considerable scale the initiative must come from the centre. This has been proved to be true. I have heard it suggested that the Town Planning Department of the Local Government Board should itself show more initiative; that the Local Government Board should send representatives about the country to stir up local authorities, and the board itself should promote town-planning schemes. Objections to this proposal are obvious. The Local Government Board are entrusted with certain judicial powers under the Act. It has to sit in judgment upon the schemes brought before

it. It would be difficult for it (so at any rate it would be urged) to sit in judgment upon schemes which it had itself, through its own officers, promoted. Moreover, it is not reasonable to look for initiative in Government Departments. The whole tradition of the Service is against it. You cannot take the initiative without making mistakes, and for a mistake of commission on the part of a Government Department or its officials there is no forgiveness. It is therefore safer to sit in judgment upon the efforts of others than to create a situation demanding action by a Government Department for which there are no precedents and on which others may sit in judgment.

The suggestion made to overcome this difficulty is that there should be created a Town Planning Commission associated with, but not officially part of, the Local Government Board. It should be a statutory authority, paid partly by fees, and any deficiencies made good out of Parliamentary Funds. The duty of this commission would be to organise a trained and efficient body of town planners, upon which local authorities could draw, and whose services would be paid by fee; while, on the other hand, the Town Planning Commission could itself initiate schemes which affected more than a single area. The experience of the last six years has shown that it is very difficult for the principal officers of most local authorities, in addition to their other work and with the limited assistance at their disposal, to take up town-planning schemes enthusiastically. These schemes require a lot of time. It would facilitate their work if they could write to the Town Planning Commission and borrow from that authority a man who had made a special study of town planning, and who, working under their direction, would be able to relieve them of the immense amount of detail work that successful town planning involves. The officer lent would be a salaried official of the commission, and the fee for his services would be paid to the commission, to whom he would return when his work in that particular locality was accomplished. The commission should also have powers to itself initiate town-planning schemes and promote a Town Planning Order, and this power should be exercised particularly in connection with arterial road schemes which would affect several districts. Arterial road schemes would be handled better by a single authority than by three or four, and it is probable that the authorities concerned would much prefer that the scheme should be dealt with by an altogether outside authority than that one of the authorities should be given powers to town plan in the areas of the others. The costs of the Town Planning Commission in promoting the scheme would be charged as part of the expenses of the scheme and would be recoverable from the local authorities.

The existence of this Town Planning Commission would also go some way to solve the problem of compulsory town planning. I have heard it advocated that town planning should be made compulsory. I distrust such proposals. You may force a horse to the water, but you cannot make it drink; similarly, you may force a local authority to adopt forms of town planning, and yet not town plan. Town planning cannot be made successful unless the official who is handling the matter is really interested in his job. Any town clerk or borough engineer, knowing that he had the majority of his councillors at his back, could, while obeying all the compulsory Orders to the letter, make town planning a by-word and reproach in his district. The existence of a Town Planning Commission enables the difficulty caused by an obstructive or incompetent authority to be overcome by some such provision as this. "The Local Government Board, on being satisfied that a town planning authority is unwilling or unable to put in force the provisions of the Town Planning Act in its area, may transfer to the Town Planning Commission all the powers, duties, and authorities of a local authority under the Town Planning Act for such district as may be specified by the Local Government Board, and all the expenses incurred by the Town Planning Commission shall be recoverable from the local authority, and, in default of payment, may be deducted from any Government grant payable to, or in respect of, any service in the area of the authority."

I do not separate in my mind town planning from housing. I find, however, that many people do so. This division is perhaps encouraged by the titles that have been adopted. Housing *and* Town Planning Act—and the piecemeal methods of English legislation and administration. Town planning in its broadest sense includes the provision of houses as well as their erection on convenient sites.

I have confined this paper to one aspect of town planning—the provision of roads—because of considerations of time and space. But the other aspect, the provision of houses, would fall also within the scope of the Town Planning Commission. There is equal need for a central authority with powers of initiative to encourage, assist and initiate schemes for the construction of new houses, both in urban and rural districts, after the war, and to take over the powers and duties of unwilling or incapable authorities. Perhaps, in order to follow the nomenclature which has already been adopted, it might be called the Housing and Town Planning Commission. At its disposal might be placed any funds the State is prepared to advance by way of grants or loans towards the building of houses.

FUNDS FOR THE SPECIAL WORKS.

(2) I started this paper by pointing out that as regards finance the experience of the past showed that the State would be very unlikely to undertake any large and unknown liability in connection with the construction of arterial roads under town planning schemes, but a defined liability, to which a maximum figure may be attached, stands in a different category. If the State only contributes a small proportion of the cost of any work, it has the guarantee that that work is not being proposed without authority, who is finding the bulk of the money, being satisfied that the scheme is desirable. Supposing the State were asked to undertake the liability for special works on arterial roads constructed under town-planning schemes approved by the Local Government Board, what would it involve? The following figures rest on very slender data, but they may form the basis of something more exact. The cost of building arterial roads of by-law width as special works may be estimated at an average of £30,000 per mile, payable by the public authorities. If built under town planning schemes the estimated cost may be put at £20,000 per mile, of which £12,000 per mile would be paid by the landowner and £8,000 paid out of public funds. Of this £8,000, £4,000 would be in respect of the special works. This is an attempt to average the cost of 100 miles of new road outside the built-up areas in all parts of the country. If the State were asked to contribute to the cost of the special works up to a limit of £200,000 per annum, it would, on these figures, enable provision to be made for 50 miles of arterial road per year, provided that the local authorities also found a like sum—and building development justified the landowners in planning out 50 miles of arterial road per annum. Whether such a proposal would be entertained by any Chancellor of the Exchequer against the competing claims of other public services, you are quite as competent to judge as I am, but it must be obvious that a defined and limited liability stands a far greater chance of consideration than the demand that the State shall undertake the responsibility of the construction of arterial roads on an unlimited scale without any guarantee that the landowners and local authorities are also prepared to contribute their quota towards the cost.

LARGER UNITS FOR LOCAL GOVERNMENT AND LOCAL RATING.

(3) The establishment of a Permanent Commission on the "Powers and Boundaries of Local Authorities" is a very big subject, demanding a paper by itself. What I should like to emphasise here is that Society is a living organism and changes from day to day. These changes demand modifications in the machinery by which we are governed. England cannot remain indefinitely under the machinery established for it by the Local Government Acts of 1888 and 1894, but to change these Acts by another general Act is also attended with dangers. Modern England is so diverse that what suits one part of it does not suit another.

Is it desirable that there should be over 100 independent highway authorities and over sixty town planning authorities within 15 miles of Charing Cross? Should some of them be combined—and, if so, which—and on what terms? Nobody can answer these questions, because it is nobody's special duty to inquire into them. What is suggested is that there should be a Permanent Commission composed of the most experienced local government officials, whose object in life should be to study these questions, and

purposes and schemes which would meet varying conditions. It would be what the Local Government Board by reason of its judicial functions is unable to do—take the initiative and make experiments.

WILL THE DIFFICULTIES BE OVERCOME?

I am interested in town planning because it can be made an effective machine for securing the best results of any expenditure out of public or private funds designed to secure better houses and better roads for the urban and rural populations of this country. Like Mr. Theodore Chambers, I want to see the towns spread over the rural areas, and the rural areas given better communication with the towns. This paper has shown the obstacles which prevent this policy from being carried out on a large scale.

With a Town Planning Commission, such as has been suggested, with power to initiate, and, when necessary, with power to execute, with sufficient funds to give assistance where assistance is required, the town planning machine will run where it is required. A Town Planning Commission should not involve on the State an annual expenditure of more than £5,000 per annum for administrative charges, and the sum at its disposal for the purposes of grants need not exceed £200,000. There are one or two slight improvements that can be made in the machine itself—viz., giving the county councils power to use the Town Planning Act, and also charging some central authority with the duty of combining the local areas to form a new rating unit where equity demands. If you accept this cold and perhaps discouraging analysis of the situation and agree the remedies; if you are free (as I am not) to advocate the remedies, and if you can get the Government to propose and Parliament to sanction them, then I see a great future before town planning in this country. I can visualise the transformation that will be worked in the course of the next 100 years. I see the rural areas repopulated; colonies of well-planned factories, houses and shops, sufficiently large to provide the amenities of life, yet connected by arterial roads (constructed to carry motor 'buses and motor cars) with the larger centres. I see a revised rating system designed to bear equitably on all parts of the country so that the large towns will not regret to see an exodus from overcrowded tenements and old-fashioned dwellings (and loss of rateable value), and the rural areas will not object to their roads being worn out by motor 'buses. I see every house provided with a garden in which its occupants can grow flowers and fruit and vegetables under proper conditions, and all dangers of potato famines gone for ever. I see healthy (not necessarily expensive) houses in which more attention will be paid to the kitchen, the scullery, the lavatories, and the cupboards than the parlour and the best bedroom, and among other results I see the present utterly damnable figures of infant mortality slowly falling to the irreducible minimum. . . . Yes; the difficulties *may* be overcome, and, if overcome, the results achieved *will* be well worth the effort.

COLLECTION AND DISPOSAL OF HOUSE REFUSE.

FORTHCOMING ROYAL SANITARY INSTITUTE DISCUSSION.

Sir Henry Tanner, chairman of council, will occupy the chair at a meeting of the Royal Sanitary Institute on Tuesday, May 8th, at 90 Buckingham Palace-road, London, at which Mr. C. H. Cooper, M.INST.C.E., borough engineer of Wimbledon, will open a discussion on the "Collection and Disposal of House Refuse." Messrs. J. Patten Barber, M.INST.C.E. (Islington), W. R. Hicks, ASSOC.M.INST.C.E. (Ealing), Frank Roberts, M.INST.C.E. (Worthing), Edward Wilkie, ASSOC.M.INST.C.E. (Chiswick), and F. Wood, M.INST.C.E. (Chesham), are among those who propose to take part in the proceedings, and for the information of others who may desire to speak we may mention that copies of the paper to be read can be obtained from the secretary three days before the meeting.

The chair will be taken at 6 p.m.

Electric Vehicle Costs at Accrington.—The Accrington sanitary inspector reports that the cost of refuse collection with an Edison electric wagon is 2s. 4·6d. per ton, as against 2s. 7d. per ton with team labour.

THE TRIBUNALS.

MILITARY REPRESENTATIVE AND SURVEYOR'S SALARY.

At the Barkisland, Yorks, Tribunal the military representative appealed against the exemption granted to Mr. T. Hutton, aged twenty-six, an A man, surveyor and sanitary inspector to Barkisland Urban District Council. Capt. Molesworth explained that the case, owing to the Barkisland Tribunal being all members of the council, had been dealt with by the Halifax Rural Tribunal. It was elicited, in the course of the hearing, that Mr. Hutton's salary was only £2 per week. That did not indicate that he was indispensable. The military representative, on account of his age and classification, had no alternative but to appeal against the exemption given, in view of the needs of the Army.—Councillor Hewitt, from the district council, admitted to Captain Molesworth that Mr. Hutton had applied to be made a sergeant in the road-making battalion.

Captain Molesworth: Then he evidently, personally, does not think he is essential, otherwise he would not have applied, would he?

Corporal Hewitt urged that, besides being surveyor and nuisance inspector, Mr. Hutton was assistant overseer, and the council thought that the case was one for exemption.

The Chairman: There is little to do now in repairing roads.

The Tribunal granted the military representative's appeal, directing, however, that Mr. Hutton should not be called up before May 15th.

At the Chailey Tribunal, in the case of the Plumpton waterworks engineer, who was the only man left, the certificate was allowed to remain.

At Lewes Tribunal the East Sussex County Council applied for the renewal of the certificate of temporary exemption in respect of a sectional roadman, classified C 2. Six months were allowed.

At Halesowen Tribunal, in appealing for the exemption of a single man, aged thirty, engaged as a steam-roller driver, the county surveyor pointed out that at first the man was rejected, but later was classified as B2 and kept at Norton Barracks, Worcester. He found the man was kicking his heels about there like a good many more, and as drivers were badly needed he secured his discharge. The man had now been called to the Colours again, and if he lost his services the roads in the locality would have to be neglected. The driver for the Halesowen district was in France, and it had not been possible to use the roller for some weeks until he secured the services of the man he was appealing for. The county council had the utmost difficulty in securing men, and the roads were getting into a deplorable condition.

The military representative suggested that drivers were urgently needed in France, but the county surveyor said such was not the case, and pointed out that one of the most competent steam-roller drivers in the employment of the county authority who volunteered for such work in France was doing navvy work. They had plenty of drivers and foremen at the front, and it was causing a deal of dissatisfaction owing to the fact that these men were being put to do labouring work. If he could not retain this man neither the county council nor himself could be answerable for the state of the roads in the district.

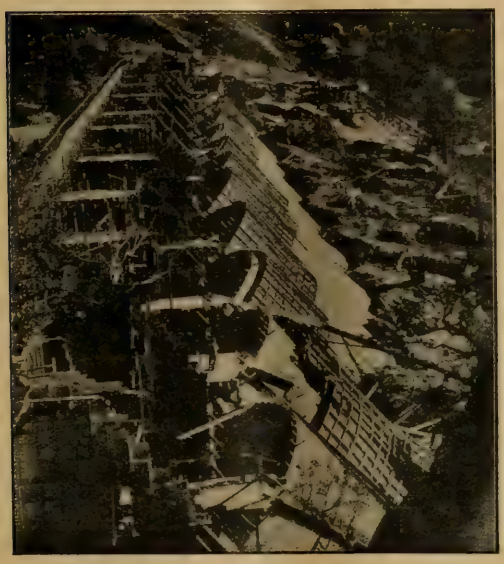
The tribunal decided to grant a month's exemption, and ordered the man to be re-examined in the meantime.

Roadmen's Wages.—At the last meeting of the Ripon Rural District Council, on attention being called to the condition of certain roads, a member commented on the wages paid in the highways department, and said that unless they were taken into consideration, in all fairness to the men, he was sure it would mean that when haytime came some of the men would leave. At the present time, having regard to the cost of living, one guinea per week was too little for a married man. If the man was a good working man, it was ridiculous to think they would retain his services at that wage.—The council referred the matter to the Finance Committee.

Multiple-Arch Dams.*

By L. R. JORGENSEN, M.AM.SOC.C.E.

During the last few years several multiple-arch dams have been built in the United States, and, thus far, have been very successful in operation. Undoubtedly many more would have been constructed had a thorough knowledge of their design and construction been more general among dam-building engineers. There are places where rock or earth fill dams, or a combination of the two, are now built, where multiple arch dams could have been constructed more economically, and they would have been more substantial.



Multiple-arch Dam During Construction.

Although, under ordinary conditions, a rock or earth fill dam can be constructed with a sufficient, although unknown, factor of safety, such dams are absolutely unsafe under abnormal conditions, such as when water accidentally passes over the crest. It is a well-known fact that nearly all failures have been due to this cause. Water passing over the crest of a multiple-arch dam would not destroy it, and, for a more or less limited time, would not hurt the foundation, if this was otherwise at all safe for such a structure. A multiple-arch dam requires a good foundation, as the load is concentrated on the buttresses, and settlement of these would be likely to cause the collapse of adjoining arches. Whenever the foundation is solid rock, however, a multiple-arch dam can be constructed and will be as substantial as any, and more substantial than most types. The stresses and dimensions can be calculated with great accuracy. The factor of safety of such a structure therefore is known within narrow limits, assuming first-class construction, and on that account precedents should not be given so much consideration as with rock and earth fill dams. These latter cannot be subjected to calculation of stresses, and therefore have to be built mostly along lines dictated by precedents. In general it can be said that a multiple-arch dam of small and medium height (less than 100 ft. high) will cost less to construct than a rock fill dam, especially if the latter is provided with something better than a wooden upstream face for the watertight cut-off. Perhaps only in rare cases would there be occasion for comparing the relative costs of a multiple-arch and a strictly earth fill dam, because if there is enough suitable earth to construct an earth dam, a sufficiently good foundation for a multiple-arch dam and sufficient good building material for such a dam are not likely to be found at the same place, and *vice versâ*.

For a multiple-arch dam higher than, say, 130 ft., the quantity of building material required, and therefore the cost of such a structure, increases quite rapidly, due mainly to the fact that the buttresses become very large and require more bracing. Eventually, therefore, a limit of height is reached where it will be more economical to build a single arch across the canyon, unless the latter is very wide. This limit of height for any dam can only be found by trying all the types possible of application, as the shape of the dam site has also quite an influence on the design.

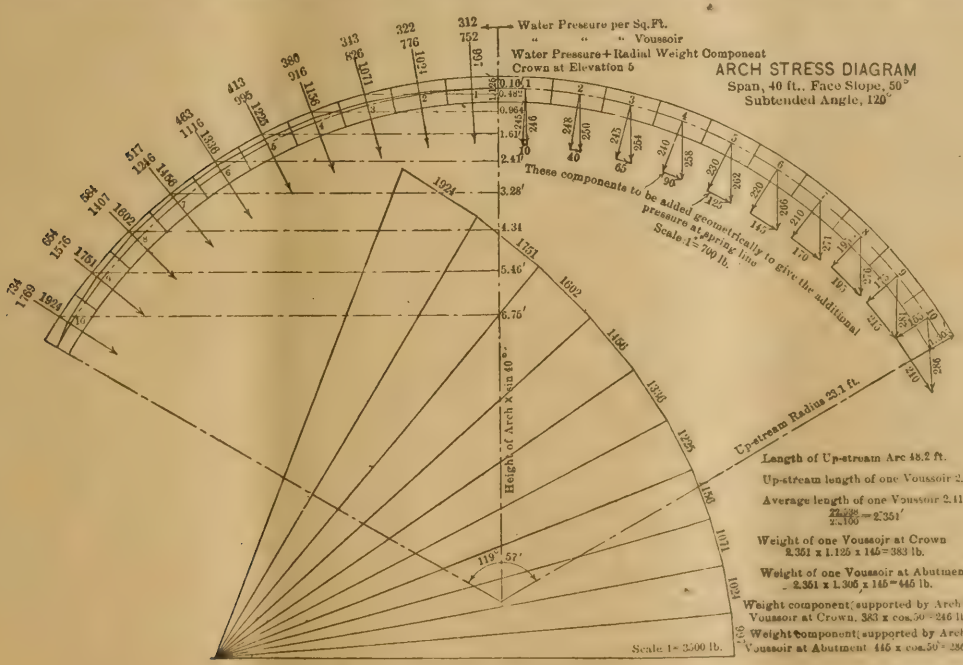

Water Pressure per Sq.Ft.
" " " Voussoir
Water Pressure + Radial Weight Component
Crown at Elevation 5
ARCH STRESS DIAGRAM
Span, 40 ft.. Face Slope, 50°
Subtended Angle, 120°
These components to be added geometrically to give the additional pressure at spring line
Scale 1" = 700 lb.
Up-stream Radius 29.1 ft.
Height of Arch = sin 40°
119° 57'
Length of Up-stream Arc 48.2 ft.
Up-stream length of one Voussoir 2.41 ft.
Average length of one Voussoir 2.41 x 22.298/2.100 = 2.351'
Weight of one Voussoir at Crown
2.351 x 1.125 x 145 = 383 lb.
Weight of one Voussoir at Abutment
2.351 x 1.305 x 145 = 445 lb.
Weight component supported by Arch of Voussoir at Crown, 383 x cos.50° = 246 lb.
Weight component supported by Arch of Voussoir at Abutment 445 x cos.50° = 286 lb.
Scale 1" = 3500 lb.

Fig. 1.

The design of the multiple-arch dam.

The first thing to be determined is the length of

* From a paper presented at a meeting of the American Society of Civil Engineers held on April 18th. "Proceedings," vol. xliii., p. 402.

each individual span. Unless there should be strong reasons for using different span lengths for the several arches making up the complete structure, all spans should be the same, in order to facilitate the form work. Theoretically, the shorter the spans, the less the material required for the arches. The material required for the buttresses remains theoretically the same, no matter what length of span is chosen. Although a dam consisting of small spans takes less material than one where the spans are larger, the cost of construction may not necessarily be less. The form work becomes more extensive, and it is more difficult to place the concrete and reinforcing steel in the resulting narrow space between the form boards than in a wider space. The arch walls are more likely to collapse than thicker ones, and thin buttresses would require elaborate bracing in order to prevent their collapse long before their crushing strength had been reached. It is the arch that holds the water back, and therefore the watertightness of the dam is to some extent a function of the thickness of this wall, although, to a much larger extent, it depends on the quality of the building material (concrete) used.

Taking all these facts into consideration, it may be stated that the practical and most economical span lies between the limits of 30 ft. and 50 ft. For high dams the economical span is near the upper limit, for low dams it is near the lower limit. A 40-ft. span would be a good average value for ordinary cases, and is chosen in the present instance.

The next factor to be determined is the length of the up-stream radius. It is known that the most economical arch is the one that subtends an angle of 133½°, and that for variations of about 10 per cent. on each side of this angle the difference in economy is very small. For the dams to be described later the extended central angle at the up-stream face is 120°, or, to be exact, 119° 57'. The volume of the arch has thereby been increased approximately 1 per cent. above the theoretical minimum, but, at the same time, the thickness has been increased 6 per cent. Since the ratio of thickness of arch to length of arc, which, for structural reasons, is a minimum at or near the crest where the thickness is small compared with the length. This ratio decreases the intensity of percolation by decreasing the area of the wetted surface, and by increasing the thickness of the wall.

With the extended angle (120°) and the span (40 ft.) applied, the length of the up-stream radius is calculated to be 23·1 ft. To facilitate form work, the width of the arches is kept constant from crest to foundation, except as noted later. Incidentally, this gives also the most economical arch, as the cubical space is thereby kept practically constant.

The arch is given a slope with the horizontal of 50° in order that the water pressure, acting on the vertical projection of this slope, may tend to cut down the shearing stress on the buttresses to zero, or to some insignificant value.

The arch carries the total water load and a large part of the load due to its own weight. A preliminary arch thickness may be found by the simple formula—

$$P \times R_u = q \times t \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

in which P equals the water pressure, in pounds per square foot; R_u equals the length of the up-stream radius, in feet; q equals the average stress, in pounds per square foot, of the area of the dam section under consideration; and t equals the thickness of the dam, in feet, at any given horizontal elevation.*

After the thickness, t, has been determined, at as many points as thought necessary, say every 10 ft. apart in elevation, the weight of the arch can be calculated and the additional arch stress due to this load determined. If the total stress is found to be excessive, a new thickness will have to be chosen.

Due to the inclination of the arch, the water pressure is not distributed uniformly between the crown and the abutments on any imaginary arch slice perpendicular to the slope. As the crown is at a higher elevation, it sustains less water pressure than corresponding points at the abutments.

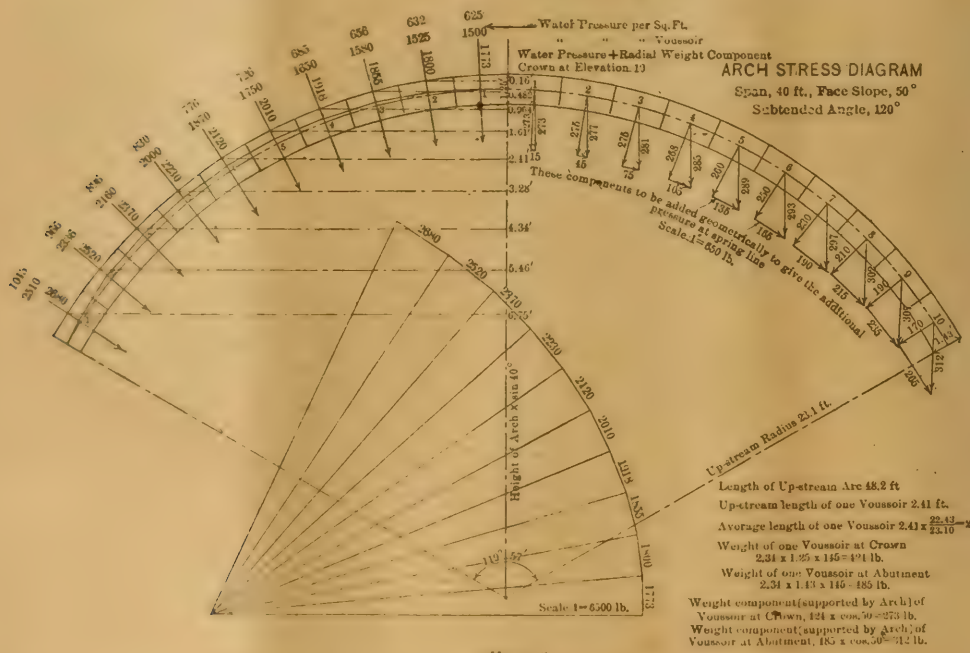

ARCH STRESS DIAGRAM
Span, 40 ft., Face Slope, 50°
Subtended Angle, 120°
Water Pressure per Sq. Ft.
Water Pressure + Radial Weight Component
Crown at Elevation 10
These components to be added geometrically to give the additional pressure at springing line
Scale 1" = 250 lb.
Up-stream Radius 23·1 ft.
Length of Up-stream Arc 48.2 ft
Up-stream length of one Voussoir 2.41 ft.
Average length of one Voussoir 2.41 x 22.42/23.10 = 2.34 ft.
Weight of one Voussoir at Crown 2.34 x 1.25 x 145 = 424 lb.
Weight of one Voussoir at Abutment 2.34 x 1.43 x 146 = 485 lb.
Weight component (supported by Arch) of Voussoir at Crown, 424 x cos.50° = 273 lb.
Weight component (supported by Arch) of Voussoir at Abutment, 485 x cos.50° = 312 lb.
Height of Arch Axis 40'
Scale 1" = 6500 lb.

Fig 2

For the case under consideration, where the length of the up-stream radius is 23·1 ft.; the subtended angle is 120°; and the inclination of the arch is 50° with the horizontal and 40° with the vertical—a point at the crown will always be

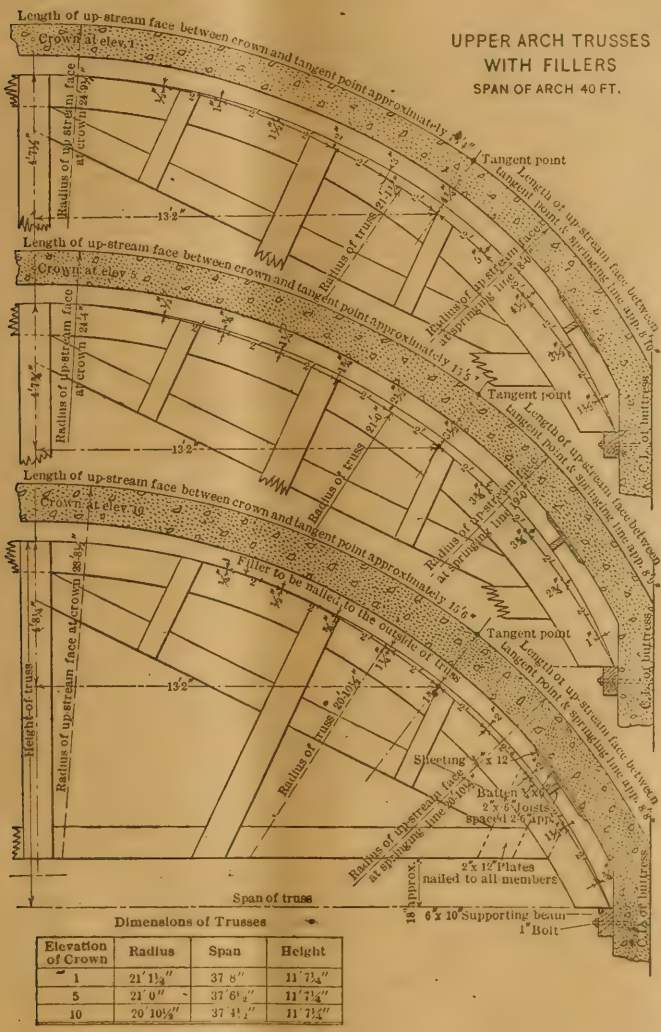
$$\frac{R_u}{2} \times \sin. 40° = 11·55 + 0·6429 = 7·424 \text{ ft.}$$

above a corresponding point at the springing line. Toward the crest this difference in elevation makes a large difference in the distribution of the load on the face of the arch, and therefore, also, in the location of the line of pressure in the arch ring. Take, for instance, an arch slice 1 ft. wide, with the middle of the crown at elevation 5, and with the middle of this slice at the springing line at elevation 5 + 7·424 = elevation 12·424. With reservoir full to the crest, the water load at the middle point of the crown would correspond to 5 × 62·5 = 312·5 lb. per sq. ft., whereas the water pressure at the corresponding point at the springing line would correspond to 12·424 × 62·5 = 776·5 lb., or nearly 2·5 times more than at the crown.

At lower elevations this large difference (2·5 times)

* The thickness of any horizontal arch ring elliptical with major axis = $\frac{R_u}{\sin 50°}$, and with minor axis = R_u) is made constant from abutment to abutment, and therefore the circular arch perpendicular to the slope must have its thickness increase from the crown toward the abutments.

rapidly grows less, and becomes unimportant with crown elevations below elevation 15. In the upper portion of the dam the radial component of the arch weight borne directly by the arch itself tends to neutralise the large difference in water pressure between the crown and the corresponding abutment points, as this weight component has its largest value at the crown, and its smallest value at the abutments. This can be shown most clearly by a graphical method, and in Figs. 1 and 2, two arch slices are drawn, each assumed to be 1 ft wide. In Fig. 1 the middle of the crown is at elevation 5, and then a width of 6 in. is taken on each side; and in Fig. 2 the crown is at elevation 10. The arch is divided into twenty voussoirs, and the forces acting on these voussoirs are calculated. These forces, though not distributed uniformly, are, of course, symmetrical on both halves of the arch, with respect to the centre line between two buttresses.


UPPER ARCH TRUSSES
WITH FILLERS
SPAN OF ARCH 40 FT.
Length of up-stream face between crown and tangent point approximately 15'5"
Crown at elev 5
Radius of up-stream face at crown 24'4"
Radius of truss 21'1¼"
Tangent point
Length of up-stream face between tangent point & springing line 8'6"
Radius of up-stream face at springing line 34'0"
Length of up-stream face between crown and tangent point approximately 15'5"
Crown at elev 10
Filler to be nailed to the outside of truss
Height of truss
Radius of up-stream face at crown 38'8½"
Sheeting 1" x 12"
Batten 1"x4"
2"x 6" Joists spaced 2'6" apart
Radius of up-stream face at springing line 38'10½"
2"x 12" Plates nailed to all members
18" approx.
Span of truss
6"x 10" Supporting beam
1" Bolt
Dimensions of Trusses

Elevation of Crown	Radius	Span	Height
1	21' 1¼"	37' 8"	11' 7¼"
5	21' 0"	37' 6½"	11' 7¼"
10	20' 10½"	37' 4½"	11' 7¼"

Fig. 3.

On the right half of each diagram are shown the weights of the different voussoirs resolved into their components. The weight of a voussoir is partly transmitted to the base through the lower portion of the arch, and partly supported by the arch. The last component is equal to the total weight of the voussoir multiplied by cos. 50°, and is set off vertically, acting through the centre of gravity of each voussoir. This vertical load is resolved into one radial component and one perpendicular thereto. The radial component can now be added directly* to the water load on the same voussoir, which, of course, is also radial. The geometrical sum of the last-named perpendicular components represents the increased axial stress toward the abutments.

On the left half of each diagram the total radial forces acting on the different voussoirs are indicated. A polygon of forces is drawn, and, by using this, the line of pressure of the arch can be determined by drawing lines parallel to the proper rays in the polygon of forces. It is plainly seen that the line of pressure lies decidedly outside the centre line of the arch; especially is this true of the arch with its crown at elevation 5 (Fig. 1).

Using these diagrams, the correct shape of the wooden arch trusses supporting the form work for these upper elevations can be ascertained. The outside members of these trusses are made elliptical above elevation 15, as shown in detail on Fig. 3, in such a way as to bring about coincidence between the line of pressure and the centre line of the arch. At elevation 15 the centre line of the arch and the line of pressure do not exactly coincide, but they are close enough together to allow the circular shape of the arch to be used with entire safety.

Below elevation 15 the arch is made circular in a plane perpendicular to its sloping axis, and above elevation 15 it is made elliptical in accordance with the diagrams Figs. 1 and 2, or a slight modification thereof, depending on how far below the crest the maximum water level is to be. It might not be out of place to state here that J. S. Eastwood, M.AM.SOC. C.E., who has been very prominent in bringing into actual use the multiple-arch type of dam, builds the top portion of the arches vertical, whereby the circular shape can be used for the entire arch.

(To be concluded.)

* For greater accuracy, this force should be multiplied by the ratio, $\frac{\text{length of mean radius}}{\text{length of up-stream radius}}$. It has been neglected in the present case, as this ratio is very close to unity.

MOTOR OMNIBUSES ON COUNTRY ROADS.

THE ABINGDON CASE: AN UNSUCCESSFUL APPEAL.

In the Court of Appeal on Monday judgment was given in the appeal of the City of Oxford Electric Tramways, Limited, against a decision of Mr. Justice Sankey by which he held that the company must pay to the Abingdon Rural District Council £350, being the expenses incurred in repairing damage to roads caused by extraordinary traffic, consisting of a service of motor omnibuses plying between Abingdon and Oxford. In the course of his judgment Lord Justice Swinfen Eady said that the Court was urged to consider the nature of the neighbourhood and the nature of the roads, but that had been considered by the learned Judge. It must be remembered that this was an entirely new service, and was quite different from the service previously in existence on these roads. The question was whether this traffic was extraordinary traffic within the meaning of sec. 23 of the Act of 1878. It had been contended that it all that these motor omnibuses did was to satisfy the needs of the district and to carry passengers to Abingdon and Oxford, then it ought not to be regarded as extraordinary traffic. In his (his lordship's) opinion, such a contention could not be upheld.

The other Lords Justices concurred, and the appeal was dismissed.

Women Labour in Power Stations. — Birmingham Corporation Electric Supply Committee have decided to release more men for the Army and to employ women in the switch-rooms, engine-rooms, boiler-houses, and in practically every department of the power stations.

Institution of Municipal Engineers.

EASTERN AND NORTH-EASTERN DISTRICT MEETING AT PETERBOROUGH.

An Eastern and North-Eastern District meeting of the Institution of Municipal Engineers was held at Peterborough on Wednesday of last week. Among those present were Messrs. A. W. Broker, district chairman, J. Bailey (Spalding), J. E. Crowson (Peterborough), J. F. Dewey (Peterborough), N. E. Dixon (Oundle), G. Dolphin (Uppingham), G. A. Penwill (Peterborough), F. Rowlands (Peterborough), H. J. Softly (St. Ives), R. Wade (North Witchford), B. L. Wright (Holbeach), G. Belson Chilvers, hon. district secretary, and B. Wyand, secretary of the institution.

The programme included a visit to the City Electricity Works and to the works of Messrs. Barford and Perkins, members being conducted round the former by Mr. F. Rowlands, A.M.I.E.E., A.M.I.MECH.E., the acting electrical engineer, and round the latter by Mr. J. G. Barford. These visits occupied practically all the time allotted, and that paid subsequently to the city museum was of a very brief nature.

The proceedings of the day concluded with a district meeting, and at the conclusion of the formal business a paper, "Experiences in a Fen Rural District," was read by Mr. Arthur W. Broker, surveyor to the North Witchford Rural District Council, and chairman of the district. The text of this paper appeared in our last issue, and we now give a brief report of the somewhat informal discussion which took place upon it.

Questions were asked as to the cost of chalk and as to the estimated cost of making up a road with a chalk foundation.

Mr. Broker, in reply, gave the cost of the chalk as from 5s. to 6s. per cubic yard. As to the cost of making up, he had unfortunately left his estimates at home, but, speaking from memory, it was from as low as £400 to £500 per mile, up to £900, the last-named figure being reached over the worst piece of road with which he had ever had to deal.

Mr. G. B. Chilvers (Oundle) said some of them did not not realise the difficulties the Fen road surveyors had to deal with, but there was one point in the paper in which mention was made of horses kicking the road out. Did they do any tar surfacing, and did it last the season?

Mr. Broker said he had not had any personal experience in the matter, but Mr. Unwin, surveyor to the March Urban Council, had had a section between March and Whittlesey, and it was found that the centre where the horses travelled was good, but where the wheels went the surface dropped considerably.

Mr. Chilvers: You mention about using a horse roll; would it be possible to use a heavier roller?

Mr. Broker: A motor-roller, such as we have seen to-day at the works of Messrs. Barford and Perkins, would be just the thing.

Mr. Chilvers thought it would be nearly as cheap to make the roads of reinforced concrete as to make them of chalk, especially when local gravels were near. Taking the cost of putting down a chalk foundation at 6s. per yard, and that of putting in reinforced concrete at 6s. 10d., it would be a far better paying proposition to have the latter.

In reply to further questions, Mr. Broker said he would not suggest using brushwood, as it went away to dust. Personally, he had never had his estimates challenged, and his council always agreed to them. In twenty years he had not had one farthing taken off.

Mr. J. Bailey (Spalding) stated he had never had any difficulty with his council. There may have been a little haggling at times, but beyond that his estimates were always carried.

Others present stated they were not so fortunate, and Mr. Wyand remarked that when in public work he always estimated fairly high with the idea that 20 per cent. would then be gracefully knocked off and a reserve still be left in hand. (Laughter.)

Mr. N. E. Dixon (Oundle) proposed a hearty vote of thanks to Mr. Broker for his paper. It had been mighty instructive and interesting to him, as no doubt it had been to everyone present. ("Hear, hear.")

Mr. J. Bailey seconded, and the vote was heartily accorded.

Mr. Wyand, commenting on the allusion in the paper to a great engineer being consulted, asked what depth was recommended to be taken out for the purpose of the foundation?

Mr. Broker said the depth excavated in some places was from 8 ft. to 10 ft. In some places the level of the water was only 2 ft. from the land.

Mr. G. A. Penwill (Peterborough) inquired whether the water could be got out, and whether it could be kept down?

Mr. Broker said for every drop of water that came in they had to apply to various drainage districts to get it away.

Mr. Chilvers thought it would lead to more efficient work if the local council undertook the work.

Mr. Broker said the land in most cases belonged to the commissioners.

Mr. Penwill: And the drainage areas don't agree with the district areas.

Mr. Bailey: In my district I have five different drainage authorities to deal with.

Mr. G. Dolphin (Uppingham) ventured the opinion that it was quite possible when the expert gave his advice he didn't know much about reinforced concrete.

Mr. Broker: If you are near chalk pits you can get over your difficulties. Another point to be considered was the sewage of the villages. When one considered that the highest part in the Fens was only 20 ft. above the lowest, how was one to dispose of the sewage? He should like to hear a paper on that some day.

Mr. R. Wade (North Witchford): The only way to get rid of it is to lift it, although it is an expensive process.

Mr. Chilvers proceeded to explain the use of the ejector at Oundle in connection with the sewage disposal, stating that the pressure, which was 35 lb. at the pumping station, was reduced to 15 lb. at the sewage works, 1½ miles distant. The ejector would take anything, even a scrubbing-brush, and the only difficulty they experienced was with corks, which sometimes floated on the surface and stopped in the outlet.

Mr. Dolphin suggested they should have a district meeting in a rural district where a drainage system was installed. The great problem in village drainage was that it could not be done in little sections to make a satisfactory job of it. The Local Government Board were too strict in their attitude towards villages, and they ought to allow authorities to obtain loans for this kind of work over a number of years, so that piecemeal work could be avoided.

Mr. Broker, in replying to the vote of thanks, said that it had been a great pleasure to him to introduce the paper, and if it had imparted some information he was amply repaid.

Crystal Palace Engineering Society.—The "Wilson Premium" for the best paper read before this society during the past session has been awarded to Mr. E. G. Wilson for his paper on "Practical Roadwork in the United Kingdom." Other papers read before the society were "Railway Engineering in China," by Mr. G. L. B. Newmarsh, and "Reservoirs," by Mr. B. C. Light. The premium was presented to Mr. Wilson by Sir Maurice Fitzmaurice, C.M.G., M.A., LL.D., president of the Institution of Civil Engineers, at the 133rd distribution of certificates, at which he presided, on the 18th inst.

Labour Detachment's "Bag."—Troops which deserve an immense amount of credit for their work, but do not often get a share in the glory of war, writes a *Times* war correspondent, are the Labour Battalions, but an incident occurred a few days ago in which these heroes of the roads had some portion of the sweets of victory. One of a party at work on the side of a road went down into an adjacent dug-out and came back to report that the hole was full of Germans. With picks and shovels the labour men advanced to the attack and pulled eighteen able-bodied but rather hungry Germans out to the light of day. The men had been there four days without being discovered.

The Surveyor

And Municipal and County Engineer.

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INSTITUTION OF CIVIL ENGINEERS.

ELECTION OF OFFICERS.

At the annual general meeting of the Institution of Civil Engineers, held on the 17th inst., the result of the ballot for the election of officers was declared as follows:-

President: Mr. William Barton Worthington (Derby).

Vice-presidents: Mr. John A. F. Aspinall (Liverpool), Mr. Harry E. Jones (London), Sir John Purser Griffith (Dublin), Mr. John A. Brodie (Liverpool).

Other Members of Council: Dr. Charles C. Carpenter (London), Dr. Dugald Clerk, F.R.S. (London), Colonel R. E. B. Crompton, C.B. (London), Mr. Maurice Deacon (Matlock), Sir Archibald Denny, Bart. (Dumbarton), Mr. William H. Ellis (Sheffield), Sir Robert R. Gales (India), Mr. A. J. Goldsmith (Queensland), Sir Robert A. Hadfield, D.SC., M.MOT., F.R.S. (London), Brigadier-General B. H. Henderson (London), Mr. Robert W. Holmes (New Zealand), Prof. Bertram Hopkinson, C.M.G., F.R.S. (Cambridge), Mr. G. W. Humphreys (London), Mr. Summers Hunter (Tynemouth), Dr. W. H. Maw (London), Mr. Charles L. Morgan (London), Mr. Basil Mott (London), Sir Henry J. Oram, K.C.B., F.R.S., Engr. Vice-Admiral (London), Mr. Frederick Palmer, C.I.E. (London), Captain H. P. R. Sankey, C.B., R.E. (ret.) (London), Sir John F. C. Snell (London), Mr. E. F. C. Trench (London), Mr. William F. Tye (Canada), Sir Philip Watts, K.C.B., LL.D., F.R.S. (London), Mr. Edward J. Way (South Africa), Sir Alfred F. Yarrow, Bart. (London). This council will take office on the first Tuesday in November, 1917.

AWARDS FOR PAPERS.

The council of the Institution of Civil Engineers have made the following awards for papers read and discussed during the session 1916-17:—

Telford Gold Medals to Messrs. G. W. Humphreys and J. B. Ball (London); George Stephenson Gold Medals to Messrs. P. V. O'Brien and John Parr Perth, W.A.); Telford Premiums to Messrs. P. V. O'Brien (Perth, W.A.), J. L. Hodgson (Luton), W. Brown (Glasgow), and P. M. Crosthwaite (London); and a Crampton Prize to Mr. F. J. Warring, C.I.E. (London).

The awards for papers published in the "Proceedings" without discussion will be announced later.

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ
(One man does not see everything.)
—Euripides.

THE WEIGHT OF MOTOR OMNIBUSES.

To the Editor of The Surveyor.

Sir,—The memorandum of the Commissioner of Police for London, which appeared in your issue of the 20th inst., gives "timely notice that new vehicles presented for licensing must be of a type differentiated from existing types by being lighter in weight, and with better form of power transmission."

The reason given for reducing weight is that, even with the existing limitations of 3½ tons unladen and six tons when fully laden, "complaints of damage and annoyance continue."

From these remarks I take it that the primary reason for reducing weight is to reduce the damage done to highways. Ten years ago we had horse-drawn omnibuses traversing water-bound macadam roads. These omnibuses fully laden weighed little more than half a fully laden motor omnibus. To-day these same roads are traversed by motor omnibuses carrying far more passengers than the horse-drawn omnibuses did. With few exceptions these roads have been surfaced with material capable of carrying motor omnibus traffic, and where so surfaced the cost of maintenance has, as a rule, not increased.

During wet weather a line of motor omnibuses will soon destroy a waterbound macadam road. Early last summer, during a continuous downpour of rain, I was one of the party of members of the Institution of Municipal and County Engineers who journeyed along some ninety miles of the country roads and lanes of Lancashire in twenty chars-à-bancs. The damage done by these chars-à-bancs could not have been repaired for £500.

If the object of the Commissioner is to reduce damage to highways he should prohibit lines of omnibuses running along macadam roads in wet weather. When a road is properly constructed it matters little whether the omnibuses traversing it weigh six or seven tons each. If this reduction in weight is appreciable, it means that fewer passengers can be carried per omnibus, and therefore more omnibuses will be required, which would add to the present congested state of the traffic in our streets. More omnibuses mean more labour, and to meet the cost of such labour it will in all probability be necessary to raise the fares.—Yours, &c.,

C. H. Cooper, Borough Engineer, Wimbledon.
April 23, 1917.

DECIMAL WEIGHTS, MEASURES, AND CURRENCY.

To the Editor of The Surveyor.

Sir,—With respect to the metric agitation, I would ask the readers of your widely-known weekly to peruse my letters in your issues: Page 330, October 13, 1916, and page 140, February 2, 1917.

In advocating the re-introduction, only as necessary, of the 5-link or 39·6-in. historical metre, I am not putting forward a new and unknown system. It is a scientific rule that three coincidences prove a theory; and for the theory of the tripod or triple scale in British weights and measures nearly twenty coincidences can be adduced.

The matter has not been taken up seriously by the advocates of a compulsory metric system and decimal coinage, because, I suppose, they rely chiefly on the wide advertisement which has been given to the metric system, and upon the ignorance of the British generally, with regard to British weights, measures, and currency. Every effort is being made to discourage the teaching of vulgar fractions, essential for the proper use of our systems in our schools, and to encourage the use of decimals, in order to get rid of these systems. In the meantime the metric system and decimal coinage are lauded to the skies, while our systems are heredy assailed.

The decimal agitation reminds me very much of Lamb's story of the discovery of roast pig. To get our crisp pork we must first burn our entire house down. It cannot be denied that if we adopt the metric system and decimal currency we must abolish all other systems. In other words we must compel the Empire, and every man and woman in it, to work and live in decimals. With tens, ½ is ·5, ⅓ is ·333, ¼ is ·25, ⅕ is ·20, ⅙ is ·1667, ⅐ is ·1428, ⅛ is ·125, ⅑ is ·1111, and here we must stop. Even so far most of

the decimals as awkward and clumsy by comparison with the best vulgar fractions, but that is not the point. Everything is to be made easy for decimals, and every possible difficulty is to be thrown in the way of vulgar fractions. The compulsory use of the metric system and the real coinage means compulsory decimals in trade business, and in all calculations.

In our existing systems we British already possess probably the most perfectly human and democratic system in the world, a model for all democratic legislation, systems which serve all men, irrespective of rank, position, class, occupation, and property. We need to separate the three scales which make up our system of weights and measures, and to understand rightly our monetary system. The former (an easy matter) would place us at once in touch with the metric system, without altering a single one of our units of records; the second I purpose to illustrate as follows:

Assuming that we divide one pound sterling into 1,000 imaginary cents of accounts, not coined, we shall find we already possess for wholesale and foreign trade, and in all large transactions, a decimal coinage down to the threepenny bit. We do not sacrifice convenience to pure theory, so the threepenny bit is divided into twelve farthings instead of 12½ cents, and by this simple expedient, and the expedient of making 12 pennies the equivalent of a shilling, we help the retail trader and the consumer (probably 90 per cent of the people), and enable them to save thousands of pounds sterling daily in small transactions, in time and labour, by the free and unfettered use of easy mental arithmetic.

In payments, our coinage as it exists leaves the rich man equally free. He quotes and works in sovereigns, florins, and decimals, and pays his way thus £2·067—

£1 (sovereign)	1,000	cents.	
10s (half-sovereign)	500	,,	
5s. (crown)	250	,,	
2s. 6d. (half-crown)	125	,,	
2s. (florin)	100	,,	
1s (shilling)	50	,,	
6d. (sixpence)	25	,,	
3d. (three-pence)	12½	,,	
1d (penny)	4	,,	nearly.
¼d. (farthing)	1	,,	,,
Total ...	£2·06755		

The above example is framed to include all British coins.

We can take any sum whatsoever stated in terms of a sovereign, and it can be paid in the same manner to within half of a farthing. In large transactions the differences would be immaterial, and in the long run would cancel out: £16·937; pay with 16 sovereigns, a half-sovereign, 4 florins, a sixpence, and a 3d. piece (¼d. excess). £19·225: 19 sovereigns, a half-crown, and a florin. £10·113: 10 sovereigns, a florin, and 3 pennies (¼d. saving).

I wish to place the issue as fairly and plainly as I can before your readers. Decimal currency and coinage mean the compulsory use of 10 in all transactions, great and small. The convenience of the men who must deal in small coins would be sacrificed to the convenience of those who have to work in the greater sums. Our existing system is a compromise and we must choose between the two conflicting interests. I would remind you readers that if we are forced into compulsory decimal coinage, we shall find the attempt to employ coverses or any similar expedient to mitigate the "tyranny of the ten," as exemplified in multiplying the "tyranny of the ten," as [illegible] Yours, &c.,

L. V. W. Phillips, M.Inst.C.E.

Hove.
April 25, 1917.

SALARIES.

To the Editor of The Surveyor.

Sir,—I am sure all surveyors and sanitary inspectors have read with pleasure that the Board of Education, at the instigation of the President (Dr. Addison), propose to make provision for a liberal increase in the salaries of teachers, both certified and uncertified. Now that the Government Department is alive to the fact that the persons who have to [illegible] their department are underpaid, I would ask Lord Rhondda to form a Local Government Board to take up the matter on behalf of surveyors and sanitary inspectors, especially in the smaller districts, who are, many of them, in a much worse position as to salary than the teachers. A very large number are devoting wholetime service for salaries varying from £70 to £100 per annum, and a much larger number for salaries from £100 to £150 per annum. The majority of these are men holding certificates and diplomas from recognised institutions. Then remuneration for time and money spent is rewarded by a labourer's wage, or little more. They are often, too, at the mercy of the council and individual members, and life to them is far from sunshine. What provision can we make for our children and for our old age on such "screw"?

I had the pleasure of presenting a paper upon this subject at the annual meeting of the Institution of Municipal Engineers in 1914 and I hope it will not be so much waste paper. I intend forwarding a copy to Lord Rhondda for his perusal.—Yours, &c.,

G. Belson Chilvers,
Surveyor, Oundle U.D.C.

April 23, 1917.

P.S. Can we hope for anything from the suggested Ministry of Health?

CEMENT JOINTS FOR CAST-IRON WATER MAINS.

To the Editor of The Surveyor.

Sir,—I have read with great interest the paper by Mr. Shaw, printed in your current issue, as such joints have been referred to in American journals for a considerable number of years.

In January last I had a few lengths of 6-in. cast-iron pipes jointed with nearly dry cement caulked in just as lead-wool would be. After a few days, water at a pressure of 130 lb. per square inch was admitted to the pipes. The result was quite satisfactory, as only a few drops of water escaped at the joints, and as there was considerable frost at this period, possibly the joints may have suffered.

In an interesting letter on this subject (*Engineering News*, December 30, 1915), Mr. Wm. Mulholland, chief engineer of the Los Angeles waterworks, states that he has used such joints on his work for over twenty years, and that his experience is that they are better than, and (strange to say) fully as flexible as, lead joints. It appears that such joints were used to some extent in the original waterworks for Los Angeles nearly fifty years ago.

Cement was used in pipe joints by Bateman, but it was merely to keep a rubber ring in place, the ring forming a watertight joint when compressed by the water.

It may be that some of your readers can refer to examples of hard, caulked cement joints for cast-iron water mains in this country.

The economy and convenience of such joints—especially for large pipes—are obvious.—Yours, &c.,

George Mitchell.

Aberdeen.
April 23, 1917.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATIONS FOR LOANS.

Birkenhead T.C.—£800 for the construction of a well.

Bolton-on-Dearne U.D.C.—£6,000 for street works and improvements.

Eccles T.C. £8,017 for a bulk electricity supply scheme.

Finchley U.D.C.—£11,000 for the extension of the electricity undertaking.

Harwich T.C.—£17,000 for an after-war electricity scheme, £2,500 for a refuse destructor, £2,500 for road widening and £5,000 for road repairs.

Southend T.C.—£45,520 for the extension of the electricity plant.

LOAN SANCTIONED.

Blackpool T.C.—£13,871 for electrical purposes.

Ince U.D.C.—£20,000 for new sewage disposal works.

Macroon U.D.C.—£570 for liabilities in connection with the waterworks.

LOAN REFUSED.

Burton T.C.—£25,000 for the electricity undertaking.

Wayleaves.*

By C. VERNIER, M.I.E.E.

[*Concluded from last week.*]

Electricity supply, also gas and in some cases water, undertakers are precluded by law† from laying their mains in private lands without special consent, and this is only possible by a complete agreement for an easement or wayleave with the owner and occupier, and upon such terms and conditions as he or they may in their entire discretion impose upon the undertakers.

By private land is here meant all land which is not dedicated for public use as a highway repairable by the local authority—for which satisfactory statutory powers are already available—and includes generally all private property, agricultural and other open land, such as parks, commons, moorland, &c., and private lands owned by railway companies and canals.

The above restrictions have been found to be a source of serious inconvenience and unnecessary expense, and a hampering obstacle in the development of electric power supply on a large scale, and in the full achievement of the economies resulting therefrom.

Cases of absolute refusal to grant an easement or wayleave have been in my experience fortunately of rare occurrence, but it is otherwise with the imposition by landowners of unnecessarily oppressive conditions, chiefly the exacting of outrageously exorbitant rents, having regard to the use which is made of the land and its value to the owner, and with some exceptions in their exercise of procrastination and utter indifference to industrial needs in dealing with such matters.

It is only fair to mention that, as a rule, where a landowner employs a full-time agent to look after his property, delays are seldom so serious as in the case of smaller owners who have to deal with the matter themselves or through a solicitor. As it is not at all unlikely that we shall witness a break-up of large estates into smaller holdings after the war, unless some measure of compulsion is granted before this happens, our difficulties will be much accentuated, and may become wellnigh intolerable.

A frequent cause of prolonged delay is that one or more owners, after the usual initial delay in replying, which varies according to the individual, make objection to the route selected over their land. Negotiations must then be reopened with other owners, who probably have already given their consent, to allow of a diversion of the route on their estate, and in consequence they not infrequently come to the conclusion that the applicant does not know his own mind, which is not usually conducive to a speedy settlement. If in addition a local authority should call for a diversion of the route when negotiations with landowners are well advanced, it is readily perceived how delays become cumulative.

I purposely refrain from quoting some of the onerous conditions which landowners have sought to impose, in some cases with success, as in the existing condition of things such information might adversely affect future negotiations.

COST OF WAYLEAVES.

Compensation for an easement or wayleave is almost invariably given in the form of an agreed annual rent, based either on a fixed sum per pole or per yard of route, or an annual lump sum payment to cover a particular stretch of route between fixed points.

Rents have steadily risen during the past seven years, and especially since the war began.‡ This is partly because landowners who at first treated wayleave rents merely as a convenient addition to the rents which they already received for the ordinary use of their land, have more and more come to regard wayleave rents as quite a useful source of additional revenue, and, especially since the war scale of taxation came into force, have made the most of their opportunities.

Moreover, as it is usually quite impossible to bring the slightest pressure to bear in negotiations for wayleaves, it has in unavoidable cases been necessary to pay some recalcitrant landowner a heavier rent than usual in order to complete wayleaves for a route, the alternative possibly being a diversion of the route on adjoining estates and many more months of delay, or possibly heavy expenditure in circuiting his estate, usually both.

Other landowners have come to hear of this rent, and have asked for the same terms. In a recent case in my experience the agent to a landowner had quoted a certain figure—a figure already agreed to by him in previous cases—for a wayleave for an underground cable along a road and across fields on his estate. He subsequently had a conversation with another land agent, who had held out for a heavy rent on a different route, which after a good deal of hesitation, and for reasons such as I have just mentioned, it had been decided to agree to. The former agent then frankly stated that he would have been quite willing to grant the wayleave on his usual terms, but as we had agreed to give another this rent, he could not accept less. This was exactly double the rent he had previously asked.

For obvious reasons, I must only speak of the cost of wayleaves in general terms, but the following examples may serve to indicate the measure of the extortionate demands which are exacted:

(1) At the present time, ignoring for the moment the formidable difficulties in renting land just when and where it is required, it would be more advantageous, on financial grounds alone, to electrical undertakers in some parts of the country to rent a strip of land wide enough for many a London street for the whole length of an overhead line at the same rents per acre as landowners secure from their tenants for some of the very best of the agricultural land in this country, and such that, even if this strip of land were put to no other use, the landowner would suffer no pecuniary loss.

(2) Alternatively, and subject to the same assumption, it would in many cases be a satisfactory business proposition from the point of view of the undertakers to rent the whole area of specified fields along the route, on agricultural tenant's terms, provided the right to sublet again for agricultural purposes were allowed.

The iniquity of these charges can be further appreciated when it is mentioned that only approximately one-half of 1 per cent. on a liberal estimate, of the land mentioned in paragraph (1) is actually diverted from its ordinary use in connection with an overhead line on arable land, and less than one-quarter of 1 per cent on grazing land.

If these charges may fairly be termed iniquitous in the case of overhead lines, what should be said of the same rents which are now frequently asked for wayleaves for underground cables? Underground cables when once laid generally require no further attention for many years, and do not obstruct or interfere in any way whatever with the ordinary use of the land; in fact, their very existence is usually forgotten by everyone except the undertaker and the grantor of the wayleave when he receives his rent.

In order to prevent any misunderstanding, let me add that rent is not the only compensation, and that additional compensation has to be paid to the landowner, tenant, or occupier for all damage to crops, grass, roads, lands, drains, fences, trees, &c., occasioned in the laying down or erection of the work, or its subsequent repair and maintenance, while, invariably there is a clause in the agreement for the diversion of the main at short notice at the sole cost of the undertaker.

No reasonable person would quarrel, in principle, with the payment of this further compensation, and although something might also be said on this subject, considerations of space do not permit of this in the present paper.

Hitherto I have only discussed the landowner's rent, but the tenant or occupier (if any) has also an interest in the land for which he should receive compensation. There are alternative methods of dealing with the occupier. The first is to agree upon terms with the landowner on the understanding that he settles with his own tenant. This is the basis on

* From a paper read on the 12th inst. at a meeting of the Institution of Electrical Engineers.

† Waterworks Clauses Acts, 1847, sec. 29; Gasworks Clauses Acts, 1847, sec. 7; Appendix to Electric Lighting (Clauses) Act, 1899.

‡ These rents have in my experience approximately doubled since the war, and more than trebled during the past seven years.

which the cost of wayleaves discussed above has been [illegible]. As a rule landowners prefer this procedure, as they do not like third parties discussing terms with their tenants, but no doubt also for the very good reason that tenants not infrequently complain of not receiving any compensation at all from their landlords, who sometimes do not even take the trouble to advise their tenants of the proposed work.

The second method sometimes adopted is to agree upon a rent with the landowner based on the applicant agreeing to make terms with the tenant. This method has the advantage that the tenant, who after all suffers such inconvenience and interference as there may be, secures compensation, but as it at least doubles the number of negotiations, and as occupiers are frequently more difficult to deal with than the landowners themselves, having a more direct and personal interest in the use of the land, it is not a method to be recommended.

COMPULSORY POWERS FOR EXPROPRIATION.

Before discussing possible remedies for this state of things, it will be well to draw attention to two points of view from which the question of electricity supply undertakers being granted compulsory powers for carrying their mains over or through private land may be regarded. These are briefly, on the one hand, that such undertakings afford a valuable public service, and that any source of unnecessary expense in [illegible] such service is ultimately a serious handicap to industry and production, and consequently contrary to the national interest. The other is that these undertakings—I here refer to company undertakings—are a source of private profit, and any saving of expenditure merely increases profits to shareholders.

The latter is undoubtedly the view that weighs chiefly in the minds of the majority of individuals and private and public bodies when they have the power, as in this case, to exercise their absolute discretion in granting or refusing a concession. Although it is evident that Parliament has already afforded some measure of recognition to the public service character of electricity supply undertakings, especially power company undertakings, by the grant of special privileges, such as the right to break up streets and roads, the compulsory acquisition of land for their works, and, on the other hand, the imposition of specified duties under penalties, and of control including the regulation of maximum charges and dividends, it does not appear hitherto to have fully recognised the not unimportant part which electricity supply has played in the national economy during the past ten years, or which it is destined to play to a much larger, and even perhaps an extraordinary, degree in the near future, provided encouraging facilities are afforded for its development.

Compulsory powers for expropriation for works of public utility, or, as it is better known in the United States, the power of eminent domain—*i.e.*, the [illegible] right of a State to appropriate private property to public uses, whether the owner consents or not—exist in most European States, including Italy, Switzerland, France, Norway, Spain, Holland, Belgium, and possibly other countries, and also in the United States.

In this country, with a few exceptions, and excepting the extraordinary war-time procedure under the Defence of the Realm Acts, the only statutory powers which are at all analogous to the right of expropriation [illegible] thereon are the compulsory powers [illegible] of land under the procedure laid down in the Lands Clauses Acts. This procedure is, however, in ordinary cases only available if secured by a special Act of Parliament or by a Provisional Order of a Government Department confirmed by Parliament, and, owing to the great cost and delay of conducting a Bill through Committee, can usually only be resorted to in connection with public works of [illegible] such as railways, docks, harbours, and the like. The price of land acquired in this manner is always excessive and in some cases many times its real value.

It appears unthinkable that the present procedure in connection with the acquisition of land for general public purposes, including electricity supply, can be long retained after the war, but in the absence of any announcement of the intention of the Government [illegible] within a reasonable period after the conclusion of peace with the former proposals for a Register of Lands and the constitution of Judicial Land Commissioners or other new proposals, I submit the following for discussion, which utilise existing machinery and are not inconsistent with precedents in our present legislation.

(*a*) That, failing agreement between a statutory electricity supply undertaker and a landowner or occupier for a wayleave for electric mains on private property, or if a landowner or occupier refuses to give a consent or fails to give a reply in writing within one month from the date of application, the Board of Trade be authorised, after enquiry, to make an Order for a compulsory wayleave within a further period not exceeding two months. In all cases the undertakers would have to satisfy the Board of Trade as to the commercial and other considerations which render this course necessary.

(*b*) That, failing agreement between the parties as to the annual rent to be paid by way of compensation, this be determined by one of the following methods:

(i) By a single arbitrator (who should be an expert) appointed by the Board of Trade, counsel and expert witnesses being excluded from the arbitration proceedings. The Board of Trade with the concurrence of the Lord Chancellor to be authorised to fix a scale of costs and disallow costs unnecessarily incurred.

(ii) By the valuation of two surveyors, one of whom shall be appointed by one side and one by the other side, and in the event of their not being able to come to an agreement, by a third surveyor appointed by two justices or a stipendiary magistrate.

In fixing the wayleave rent regard should be had to the average annual rent (if any) received from the land under consideration during the previous seven years, and a reasonable percentage should be added to cover permanent damage, disturbance, or inconvenience which may arise from the proposed works, and for the right of entry upon the land. This percentage would obviously be greater for overhead wires than for underground cables. The arbitrator or valuer should not be allowed to take into consideration any saving in expenditure which is afforded to the undertakers by the grant of wayleave, but should apportion the rent equitably between landowners, tenants, and occupiers, and all who have a beneficial interest in the land.

Any of the parties, failing agreement, should have the right to apply for a revision of the rent once in every seven years. Damage to crops, &c., caused in the execution of the work should be settled separately and in the usual manner.*

(*c*) That in the cases of urgency the undertakers be authorised to enter upon the land and commence the execution of the work as soon as an Order has been made by the Board of Trade and before the assessment of the compensation, upon serving a notice, making a satisfactory deposit, and giving bond.

(*d*) That a right of appeal to the Board of Trade be allowed in all cases where a landowner or occupier demands the removal or diversion of a main at the cost of the undertakers which in the opinion of the undertaker is unreasonable or unnecessary.

The success or failure of any proposals such as these would obviously depend upon the degree of "public utility" which might be attached by the Government Department concerned to the various kinds of electrical services, but even if compulsory powers were only granted in important and difficult cases, the mere existence of such powers and the possibility of the grantor of a wayleave having to justify his demands would, I believe, exercise such a moral effect that in many cases an agreement would be possible without putting into operation the machinery created. It would materially assist in this very desirable consummation if undertakers were enabled to secure a declaration from the Board of Trade of the public utility of a proposed main for which wayleaves are required before negotiation is entered into with landowners and others, in all cases where the Board is satisfied that the public interest justifies such a declaration.

Suitable rules could be drawn up to preclude applications on trivial grounds.

In conclusion, I regret that I have only found it possible to deal broadly with the general question of electric mains over agricultural and similar open land, and that considerations of space have not permitted the investigation in detail of other questions, such as wayleaves for the laying of electric mains, along, over, or across railway and canal lands, over and under railway bridges and in private roads. Most of these questions, while of importance, are not so urgent as the main question dealt with in the paper, a solution for which could not fail to assist in removing other disabilities such as these.

* Electric Lighting Act, 1882, sec. 17.

The Decimal System of Coinage, Weights and Measures.*

By HARRY ALLCOCK, M.I.E.E., A.M.I.MECH.E.

[*Concluded from last week.*]

Let us, then, examine the possibilities of the adoption by the world of one system of weights and measures and then consider how far we can assist in bringing about such a desirable state of affairs.

We might usefully commence our examination by studying the progress made by the international metric system since its adoption by France in the year 1840.

The status of the metric system in the several countries of the world is shown in the following tables, which I have extracted from a report dated January, 1916, by Dr. Samuel W. Stratton, Director of the Bureau of Standards at Washington, to the International High Commission, relative to the use of the metric system in America's export trade:—

1. Metric System Obligatory (Thirty-four Countries).
(Population, 437,330,000.)

Argentina	France and colonies	Peru
Austria	Germany	Portugal and colonies
Belgium	Guatemala	Rumania
Brazil	Holland and colonies	Salvador
Bulgaria	Honduras	Servia
Chile	Hungary	Siam
Colombia	Italy	Spain
Congo	Luxembourg	Sweden
Costa Rica	Mexico	Switzerland
Cuba	Nicaragua	Tunis
Denmark	Norway	Uruguay
Finland		

2. Metric System Optional (Eleven Countries).
(Population, 727,233,000.)

Bolivia	Great Britain and Ireland	Russia
Canada	Greece	United States of America
China	Japan	Venezuela
Egypt	Paraguay	

3. Adhering to International Metric Treaty (Twenty-six Countries).
(Population, 683,523,000.)

Argentina	Great Britain and Ireland	Russia
Austria	Hungary	Servia
Belgium	Italy	Siam
Bulgaria	Japan	Spain
Canada	Mexico	Sweden
Chile	Norway	Switzerland
Denmark	Peru	United States of America
France and Algeria	Portugal	Uruguay
Germany	Rumania	

The above countries maintain, at joint expense at Paris, the International Bureau of Weights and Measures for the custody and comparison of the fundamental international metric standards to which all metric units, measurements, and national standards of the world are referred.

This astonishing growth goes to prove that in our search for one universal language of quantity our choice is now in effect limited to the British Imperial System or the International Metric System, which is, of course, a pure decimal system.

There is a tendency in some quarters to recommend the adoption of a middle course—that is, to decimalise the present British units of weights and measures.

On this question it is instructive to recall the recommendations of a Select Committee of the House of Commons, who, in the year 1862, reported that "it would involve almost as much difficulty to create a special decimal system of our own as simply to adopt the metric system in common with other nations. And if we did so create a national system, we would, in all likelihood, have to change it again in a few years, as the commerce and intercourse between nations increased, into an international one."

The volume of international trade is now, of course, greater than was even dreamed of when the above advice was tendered to the Government, over fifty years ago.

When reduced to this simple issue I think our acceptance of the metric system is practically forced upon us, and the sooner therefore we accept this fact the less will be the magnitude of the difficulties and inconveniences which are incidental to any change.

He would indeed be a bold man who would undertake the mission of converting a metric country to the use of the British system.

Conversely, the advocates of the metric system in British Imperial countries are on very solid ground since the metric system is a scientific system having advantages demonstrated by—

(1) The decimal relation between the units.

(2) The extremely simple relation of the units of length, area, volume and weight to one another.

(3) The uniform and self-defining names of the units.

The use of the metric system progresses because of its scientific structure, while the British Imperial system stagnates. Proof of this is provided by the fact that every country seeking to improve upon its native system of weights and measures commences by examining the available systems used by other countries, and invariably ends by adopting the metric system, never the British Imperial system. Furthermore, no country, having once adopted the metric system, has later abandoned it.

A favourite argument against our compulsory adoption of the metric system is that, by merely prolonging the present permissive use of the metric system side by side with our existing British Imperial system, the better system would ultimately survive.

A similar argument is put forth to the effect that those who desire the introduction of the metric system should lead the way by conducting their own business solely in that system.

I submit that any such voluntary piecemeal adoption cannot be expected, as the pioneers would thereby penalise themselves by throwing themselves out of touch with their neighbours.

The position is analogous to that of the Daylight Saving reform. No benefit could be derived from that reform until it was made compulsory, for had any enthusiast adopted the principle before its general adoption he would have found himself at his office or works, say, an hour before he could communicate with his clients, and when, at the end of the day, his clients desired to communicate with him, they would have found he had already gone home, having completed his day's work.

I trust I need say no more in support of the present demand for our compulsory adoption of the metric system.

It will be recalled that a Bill, usually known as Lord Belhaven's Metric Bill, passed through the House of Lords in 1904, but was rejected by the House of Commons in 1907 by the small majority of 32.

In the course of the House of Commons debate, Mr. Haworth made a statement to the effect that 80 per cent to 90 per cent of the engineers were then opposed to the metric system.

I have no means of ascertaining the correctness or otherwise of that assertion, but it would certainly not represent the views of our engineering firms at the present time.

In the autumn of 1915 the editors of the *Electrical Review* ascertained by a special canvass that firms engaged in the electrical and allied trades were in favour of this reform in the proportion of about four to one.

On January 17th of this year the British Engineers' Association issued a questionnaire to all their members, in which separate questions sought their views upon the desirability of our compulsorily adopting decimal coinage, metric weights, metric dry and liquid measures, and metric linear measures respectively.

Ninety per cent, 87 per cent, 86 per cent, and 83 per cent of the replies received are in favour of these reforms in the order of mention.

The Decimal Association recently arranged to ascertain the views of 25,000 British firms of a widely-diversified character. Up to date 3,036 replies have been received, of which 2,994 are in favour of the adoption of decimal coinage and the metric system.

*From a lecture delivered on March 27th at the Institution of Civil Engineers, Sir Maurice Fitzmaurice, C.M.G., president, in the chair.

weights and measures throughout the United Kingdom.

A great amount of misapprehension has hitherto existed as to the effect the compulsory adoption of the metric system would have upon our British manufacturers, some of whom fear that on the very day a Metric Act became law they would forthwith have to scrap all their existing patterns, tools, and other workshop standards.

It will be of interest to those holding such views to learn that a new draft Metric Bill, which is now being prepared by the Association of Chambers of Commerce at the request of over 100 chambers, aims at making the use of the metric system compulsory in all commercial transactions, but includes the following clause:

"Provided that nothing in this Act shall

(*a*) Affect the manufacture or use of any machinery tool, pattern, sieve, template, or other article made by measures other than metric measures."

The passing of an Act on this basis would thus mean that, while we should all be required to buy and sell in metric quantities, we should be at liberty to continue the use of our existing weights and measures for manufacturing purposes until such time as we ourselves chose to amend them.

No doubt manufacturers, under the compulsion of selling their goods on the metric basis, would, in course of time and at their own convenience, arrange to manufacture such goods to metric dimensions, but it is important to note that the above provision would have the effect of allowing each manufacturer to fix the length of his own transition period, and in this way unnecessary hardship would be avoided.

We engineers, for instance, know that in the normal course of development in our industry the existing patterns at any given date become either worn out or obsolete in design within a fairly limited period, and the above-mentioned concession would thus enable us to use our existing patterns, &c., for their full normal lives, at the end of which they could be economically replaced by new ones based on the metric system.

It would appear highly probable that the reorganisation of our workshops for the production of new plant of all kinds after their feverish concentration on the manufacture of war munitions will involve many new designs, tools and processes, and this approaching time of flux would provide an excellent opportunity for our all starting afresh on the metric basis.

Many of our more modern industries, such as the manufacture of motor cars, aircraft, electrical apparatus, &c., already employ the metric system in their workshops, and the compulsory adoption of that system would thus serve to provide our older industries with a unique opportunity for bringing themselves up to date.

The question arises: How much longer are we prepared to work in two systems? Even if we would, we cannot avoid using the metric system to an ever-increasing extent, but there is no reason why we should continue to hamper ourselves by perpetuating the use of our own chaotic and cumbersome Imperial system. If there be any who are appalled by what may appear to them as a revolutionary step I would urge them to bear in mind the manifold advantages which would accrue to them and to the entire community by our whole-hearted adoption of the metric system.

QUESTIONS IN THE HOUSE.

In the House of Commons on Monday the Prime Minister was asked whether the Government were prepared to give consideration in any manner to the question of British and Imperial weights and measures and the decimalisation of British coinage after the war; and if so whether he would appoint a small committee as a subcommittee of the Reconstruction Committee or otherwise, to consider and report to him upon this question.

Mr. Bonar Law, in reply, stated that the matter fell within the terms of reference to Lord Balfour of Burleigh's subcommittee of the Reconstruction Committee on Commercial Policy, and he was informed that the committee was considering the subject.

Coast Sand Dunes. (By Gerald O. Case, St. Bride's Press, Limited, 21, Bedford Chambers, E.C. 1, price 5s.)—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not evident that when we return to normal times the newly reconstituted Institution of Sanitary Engineers will again take its place as a most useful body of sanitary experts of all classes and practice? Is it not the only institution where leading sanitary engineers can meet the men who carry their ideas into effect and talk over questions of common interest, and is it not evident that, under the presidency of that eminent engineer Mr. W. J. E. Binnie, M.INST.C.E., the institution should have a prosperous and useful future before it?

* * * *

Are not the model forms for statistics, reproduced in the current issue of the *Journal* of the Institution of Municipal and County Engineers, very carefully prepared? But what will be the feelings of the already overworked municipal surveyor if he is asked to fill in all the details that are required? Will he not be inclined to say: "Preserve me from my friends"?

* * * *

Is there not an instance of the colossal scale on which things are done in the United States of America in the newly-constructed Institute of Technology, Massachusetts, in which the area of the floor space of one room—viz., the engineering laboratories—is no less than 75,000 sq. ft.? Should not the minds of the young engineers trained under such surroundings expand into a vigorous condition that would defy the greatest engineering or other difficulties?

* * * *

Has any decision ever been arrived at as to whether it is cheaper and better to brush or scrape the surface of an imperviously paved street, or to flush it down with water? Would not the answer depend upon a number of circumstances, such as the cost of water, the wages of men, the cost of mechanical sweepers, and other factors, before any reliable conclusion could be formed?

* * * *

Is it not rather interesting to find, from a statement made by a speaker at the recent meeting of the "Safety First" Council, that no fewer than five metropolitan borough councils had "caught on" to the idea of pedestrians keeping to the left, instead of to the right of the footpaths, and that several councils of large provincial towns were seriously considering the adoption of the change? Why is it that the Chief Commissioner of the Metropolitan Police is not in favour of it? Is it because policemen, telegraph boys, and other "officials" seem studiously to break the present rule of "keep to the right"?

* * *

Is not the Roads Improvement Association to be congratulated on the report which was presented to the annual meeting yesterday? When it is considered that the secretary, Mr. Wallace E. Riche, was called up for active service some time ago, and that consequent upon the war the funds of this useful body have been greatly reduced, does not the manner in which its efficiency has been maintained show that there is an energetic spirit in this association? Has not Mr. Haworth, the secretary *pro tem.*, contributed very largely by his energy and devotion to this result?

* * *

What is the Metropolitan Water Board going to do in view of their failure to obtain tenders for certain work and materials which are urgently required? Is the war really the reason why no tenders could be obtained, or is it that the stringent regulations of the contracts are not looked upon with favour by would-be tenderers?

* * * *

Is there not something to be said in favour of the by-law which obtains in Austin, Minnesota, which imposes a penalty of $50 on any company or individual who breaks up a road, or footpath, for a new gas, water, or sewer connection, when the repairing or reinstatement of such work has been completed by the authorities? Would not such an ordinance go far to prevent the frequent disheartening disturbance which occurs in this country when streets which have recently been put into thorough order are incontinently broken up again, when a little foresight would have prevented such an occurrence?

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Clydebank T.C.—Certain property adjoining the municipal buildings has been purchased for the extension of office accommodation.

Poplar B.C.—The Baths and Wash-houses Committee recommend the borough council to apply to the Local Government Board for sanction to borrow £10,000 for the erection of wash-houses and slipper baths at Bromley-by-Bow.

Yarmouth T.C.—The Property Committee have approved the plans of the borough surveyor, Mr. J. W. Cockrill, for the rebuilding of a store, at an estimated cost of £450.

HOUSING AND TOWN PLANNING.

Athy U.D.C.—The council have decided to approach the Government with a view to obtaining a grant of money from the loan already sanctioned for a housing scheme. Houses, it was stated, are urgently needed for the mining population.

Birstall U.D.C.—It has been decided to prepare a housing scheme, to be carried out after the war.

Huddersfield T.C.—The town council have accepted the Local Government Board's suggestion that sixty houses should be erected on the corporation's building site at Waterloo, instead of a corresponding number on the Royds Hall and Salendine Nook sites. The borough engineer, Mr. K. F. Campbell, has been instructed to prepare all necessary plans and estimates, particularly plans showing the position of the sixty houses at Waterloo, and of the 126 houses on the other sites, and other plans asked for in the letter of the Local Government Board.

Plymouth T.C.—The town council have authorised the Special Works Committee to consider the preparation of a town planning scheme.

Thedwastre R.D.C.—The clerk has received instructions to communicate with the parish councils inquiring as to housing and other schemes they would be prepared to recommend for carrying out after the war.

MOTOR TRANSPORT.

Linlithgowshire C.C.—The Linlithgow District Committee propose to purchase a second-hand tractor.

Stockton T.C.—A decision has been reached to purchase a 5-ton steam wagon, interchangeable with water tank and tipping gear, for approximately £800.

Thornaby-on-Tees T.C.—The question of purchasing a motor fire engine is under consideration.

Wolverhampton T.C.—The Electricity Committee have received authority to purchase three 3½-ton electric vehicles.

PARKS AND OPEN SPACES.

Leicester T.C.—The town council have agreed to the recommendation of the Parks and Recreation Grounds Committee to make use for food production of the 80 acres of land comprised in the Western Park golf links.

REFUSE COLLECTION AND DISPOSAL.

Bradford (Wilts) U.D.C.—Steps are being taken to establish a central depot in the town for the reception of waste paper.

Crompton U.D.C.—It was reported that the cost of the new destructor was £3,260, and the extras £76. Satisfaction was expressed at the small amount of the extras.

Faversham R.D.C.—The surveyor, Mr. J. G. Chittenden, submitted a report in which he estimated that it would cost the council over £400 per annum to do the scavenging of Teynham and Lynsted by direct labour. In the course of some discussion, the medical officer (Dr. Selby) urged the importance of this work being done efficiently, and made some reference to the idea mooted some time ago of a drainage scheme, but the chairman said this would run into as much as £8,000. Eventually it was decided to accept the tender of Mr. T. Pilcher, at £400, a committee being asked to report during the year their views with regard to the work being done by direct labour.

Hammersmith B.C.—By collecting 132 tons of waste paper last year the borough council have made a profit of £244.

Oystermouth U.D.C.—As regards the scavenging of ashes, the council have adopted a resolution that it can be done much cheaper by local contract, and the estimate of £600 has been allowed to stand, but tenders will be invited.

ROADS AND MATERIALS.

Argyllshire C.C.—It has been decided not to renew the road contract, but instead that the work of road maintenance should be done by direct labour, and that, in addition, £700 be spent on quarrying and carting.

Chertsey R.D.C.—The council are still in negotiation with the War Office respecting the agreement as to the taking of gravel from Chobham Common.

Derbyshire C.C.—A sum of money has been voted to enable the Highways Committee to purchase a site at Ambergate in connection with the scheme for the provision of a central depot and mixing plant for the production of tar-macadam.

Egham U.D.C.—Claims amounting to £243 are being made upon the military authorities for damage to roads by motor lorries.

Forden R.D.C.—The surveyor, Mr. W. P. Hole, stated that, though he had plenty of work for the tractor, he could not get labour for it, and in the circumstances he advised that the engine should be hired to the county council for the purpose of breaking stones, at the rate of £1 per day, the county council to supply the coal, pay the driver, and be answerable for any breakages. The council agreed to leave the matter in the hands of the surveyor to make the best terms he possibly could.

Haverhill U.D.C.—The council have accepted the tender of the Essex Steam Rolling Association, Limited, for steam rolling.

Sherburn R.D.C.—The surveyor, Mr. W. Plewes, reported that expenditure in his department had been only £600 as against an estimate of £1,500. This, however, was due to inability to get supplies of stone and the expenditure was in effect only deferred.

Sheringham U.D.C.—It has been agreed to spend £300 on road repairs, and £50 on the painting of the promenade shelters and seats.

SEWERAGE AND SEWAGE DISPOSAL.

Ince U.D.C.—Plans have been prepared of a new scheme of sewage disposal, which is estimated to cost £20,000.

WATER, GAS, AND ELECTRICITY.

Bolton T.C.—A Committee of the House of Lords has been hearing evidence in support of the Bolton Corporation Water Bill, by which that authority seek for powers to obtain an additional source of supply from the head of the Lune Valley, and to convey the water by an aqueduct or main 45 miles in length to the High Rid reservoir at Bolton. It is proposed to abandon the works authorised by an Act of 1905, except the Delph reservoir in the township of Turton. This, while not yet completed, has largely exceeded the estimated cost. The estimated cost of the proposed new works is £2,452,576. There were a large number of petitions against the Bill, but in many cases an amicable arrangement has been reached with the promoters, and the principal opponents are now the outside districts, including Turton, Farnworth, Kearsley, Little Hulton, Worsley, Westhoughton, and Bartonupon-Irwell, the Manchester Corporation, the Lancashire Rural District Council, and the Fylde Water Board. Mr. H. Lloyd, K.C., representing the promoters, admitted that the cost of

the 1905 scheme had been gravely under-estimated. The Delph reservoir would cost £375,000 instead of £160,000, and the water 10½d. a thousand gallons instead of 4½d. If they were to go on with the rest of the scheme the cost would work out at 2s. a thousand gallons. The town was in dire necessity. It was proposed to carry out the Lunesdale work in two instalments, the supply from the first of which would last till about 1960, and from the second till the beginning of the next century. The cost worked out at 10½d a thousand gallons. The corporation did not propose a "rush" to begin the work during the war, but they wished to be prepared.

Falkirk T.C.—A committee has been appointed to visit the Glasgow Corporation gasworks for the purpose of reporting upon a cyanide plant.

Hull T.C.—The Water and Gas Committee have agreed to extend the water supply to Aldborough in accordance with terms arranged with the Skirlaugh Rural District Council and the other authorities concerned. It is expected that the supply will be available in six weeks' time. The Electricity Committee propose to purchase a new grab for handling coal and ashes, at an estimated cost of £1,800.

Lurgan U.D.C.—The gas manager reported recently that on the last year's working there was a deficiency of £400 on the gas undertaking, and he anticipated a similar deficiency this year unless the present maximum price of 4s. 6d. was raised. To meet the two years' deficiency it would be necessary to increase the price 6d. per 1,000 cub. ft.

Wolverhampton T.C.—It is proposed to lay a high-tension electric cable from the School-street station to certain manufacturing premises, at an estimated cost of £2,000.

MISCELLANEOUS.

Blackpool T.C.—The corporation tramways earned a profit last year of £19,326, £3,000 more than in the previous twelve months, but over £5,000 less than in 1913.

Huddersfield T.C.—The town clerk has been requested by the subcommittee appointed to consider the desirability of establishing a works department under the control of a competent manager for the building of houses by direct labour to obtain certain information from other towns.

Manchester T.C.—The Tramways Committee report that the revenue of the undertaking last year was £978,000, the highest on record.

Ripon T.C.—The council are considering the question of providing improved fire-prevention appliances.

PERSONAL.

Mr. C. Mathew, borough engineer and surveyor of Ryde, Isle of Wight, has resigned.

Mr. G. Jeffries has been appointed temporary surveyor and inspector of nuisances to the Swaffham Urban District Council.

Mr. G. C. Bedington, Assoc.M.Inst.C.E., F.S.I., Public Works Department, Federated Malay States, has been elected a member of the Royal Sanitary Institute.

Mr. George Lee, surveyor for the eastern portion of the county of Galway, is leaving for France, where he will be engaged in supervising road-making and railway construction.

Mr. G. T. Carter, sanitary inspector to the Romford Rural District Council, has been appointed acting surveyor to the same authority during the absence of Mr. W. J. Grant on war service.

Mr. R. Davidson, road surveyor to the Keith District Committee of the County of Banff, recently announced his intention of retiring, but has since expressed his willingness to remain in office until after the war.

Mr. S. W. Mobbs, assistant borough surveyor, has been appointed acting borough surveyor of Lowestoft, in succession to Mr. G. M. Hamby, till the end of the war, when the town council will reconsider the matter.

Lord Rhondda, the President of the Local Government Board, who has been suffering for over a week from a severe chill, which specially affected his throat, and confined him for some days to his bed at his London residence, is now somewhat better, and has been staying at Llanwern, his place in Monmouthshire.

Mr. Samuel McCartney, assistant county surveyor of Londonderry, has obtained a commission in the Royal Engineers. The county council have passed a resolution approving his action and instructing the county surveyor (Mr. C. L. Boddie) to arrange for the appointment of a substitute for whatever term he might consider advisable, "and at a reasonable rate of remuneration."

Mr. Raymond A. Newstead, who has acted as assistant borough surveyor of King's Lynn, has been appointed acting borough surveyor and water engineer in the absence of the borough surveyor, Mr. A. J. Smith, with the Roads Construction Company of the Royal Engineers. Mr. Newstead, it may be noted, has served sixteen months with the Royal Naval Divisional Engineers, six months of that time being spent on the Gallipoli Peninsula. The statement reproduced from a local newspaper last week that the electrical engineer will superintend the waterworks and the county surveyor the main roads is erroneous.

With their borough surveyor on military service, the Mansfield Corporation are considering the appointment of an acting surveyor, and at the last council meeting a sub-committee reported the receipt of a letter from Brunt's Trustees stating, in reference to a suggestion from the Highways Committee, that Mr. A. C. Howard would be allowed to take up the position on certain conditions. Subsequently a letter was received from the trustees withdrawing their offer, and the council decided to refer the whole matter to the General Purposes Committee, a committee being appointed to look after the interests of the borough surveyor's department in the meantime.

KILLED IN ACTION.

Second-Lieutenant Norman Hardie, R.E., was, we regret to state, killed in action by the bursting of a shell on March 27th. He was a member of the staff of the borough surveyor's department, Stoke-on-Trent. He served his articles with the borough surveyor of Eccles, and was afterwards appointed building inspector to the Corporation of Eccles. In February, 1915, he was appointed on the staff of the borough surveyor's department at Stoke-on-Trent. He joined the Artists' Rifles in December, 1915, and in July, 1916, was transferred to the Royal Engineers' Cadet School at Newark-on-Trent. He was granted his commission in October, 1916, and went to France in December. The deceased, who was 24 years of age, was the son of Mr. William Hardie, headmaster of Clarendon-street Council School, Bolton.

Flight Commander Sidney Edward Cowan, youngest son of Mr. P. C. Cowan, D.Sc., chief engineering inspector of the Local Government Board for Ireland, who was reported in The Surveyor in December last as missing, is now (the *Times* states) unofficially reported killed in action. A letter from an officer at the front, a schoolfellow of young Cowan at Marlborough College, reports that he came across his friend's grave in an old graveyard at Ablainzevelle, twelve miles south-east of Arras. It is railed in, and a cross at the head bears an inscription in German: "In memory of a gallant English officer, Captain S. E. Cowan, killed in an air combat, November 17, 1916." For a youth of 19, Captain Cowan had a wonderful record in the Air Service, having been three times decorated within a year. He gained the Military Cross in May, 1916, a bar to the Military Cross October 20, 1916, and a second bar on November 14th. He won the Cross by an exploit which was described in the *Gazette* as follows: "Dived on to an enemy machine in the enemy's lines, and drove it to the ground, where it was smashed and then circled round and fired at the pilot and observer as they ran for shelter. Although forced to land through his engine stopping, he contrived to restart it, and got back under heavy fire."

Public Health Administration in Scotland.—Replying in the House of Commons to a question as to whether the recent utterances of Lord Rhondda with regard to the establishment of a Ministry of Health had any application to Scotland, the Secretary for Scotland, Mr. Munro, said that any proposals affecting the machinery of government in relation to the public health and its administration, of course, affected that country as well as England.

EFFECT OF EXCESS WATER IN CONCRETE.*

By Duff Abrams,
Professor in Charge, Structural Materials Research Laboratory, Lewis Institute, Chicago.

Experience has indicated about what proportions of cement and aggregate must be used to give concrete of the necessary resistance for a given purpose, but little attention has been given to the interrelation of the effects of varying quantities of water on the resistance of the concrete. A thorough investigation of this subject is in progress at the Structural Materials Research Laboratory. These tests have shown the following relations to obtain:—

(1) With a certain aggregate of the same grading and sufficient water to produce a concrete of a given plasticity, the strength of the concrete, within the usual range of mixes, is proportional to the quantity of cement in a unit volume of concrete.

(2) With a given aggregate and the same quantity of cement, the strength of the concrete is a maximum with the smallest quantity of water which can be used to produce a plastic mix; any increase in the quantity of water is accompanied by a very rapid falling off in the strength of the concrete.

(3) With a given aggregate mixture, the same quantity of cement, and sufficient water to produce a concrete of definite plasticity, (*a*) the strength of the concrete increases with the "coarseness" of the aggregate up to a certain limit; (*b*) this limit of "coarseness" is higher for a larger quantity of cement and lower for a smaller quantity of cement; (*c*) the limit of "coarseness" of the aggregate which it is feasible to use varies slightly with the character of the material, being somewhat lower for a mixture of sand and crushed stone than for sand and well-rounded pebbles, and lower still for mixtures in which crushed stone or similar material is used as fine aggregate.

(4) For given proportions of cement and aggregate the quantity of water required for a definite plasticity depends largely on the grading of the aggregate, and to only a minor degree on the character of the materials, shape of particles, &c.

(5) For a given aggregate, the quantity of water required to give concrete of the same relative plasticity is directly proportional to the quantity of cement.

The tendency has been during recent years to use entirely too much water; in many instances the water used is 50 to 100 per cent in excess of the quantity which gives the highest strength, resulting in concrete of not more than 25 to 50 per cent the strength that should have been obtained with the same cement and aggregate and a proper quantity of water. While some sacrifice in strength is generally necessary in order to secure concrete which may be handled and placed at low cost, it is absurd to sacrifice 50 to 75 per cent of the strength which is practically available in this way. While the injurious effect of excess water in concrete has been given little attention, a great deal of emphasis has been placed on the benefits to be derived from the use of coarse, well-graded aggregate.

The experimental work referred to above has already thrown much new light on this subject. We are forced to the conclusion that the chief advantages of well-graded and coarse aggregate as compared with poorly-graded aggregate comes from the fact that the concrete can be mixed to a workable plasticity with less water, and not to any inherent difference in the behaviour of aggregate of different sizes. In other words, while coarse, well-graded aggregate is highly desirable, little or nothing is gained by using aggregates of the highest grade unless we take advantage of the fact that it can be mixed with correspondingly less water. This makes it apparent that many of the shortcomings of concrete made of fine or poorly-graded aggregate should be charged to the additional water required to mix the concrete.

It is as important that an upper limit be placed on the quantity of water as it is that a lower limit be placed on the quantity of cement in the batch. It would be just as consistent to specify the quantity of aggregate and water and leave the proportioning of the cement to the judgment of the mixer foreman as to specify the quantity of cement and aggregate and leave the proportioning of the water to the mixer gang. Exactly the same effect is produced by the use of an excess of water as by a deficiency in cement, and it is more important now that special attention be given to the water in concrete, since the present methods give reasonable assurance that the proper quantity of cement is used.

All the benefits which may arise from using good cement, coarse, well-graded aggregates, thoroughly mixing the concrete, &c., are completely nullified if an excess of water is used in the mix.

"In mixing concrete use the least quantity of water that will produce a workable mix, then give the concrete as much water as possible after it has begun to harden," is the only safe rule to follow.

Probably the greatest improvement which can be made in our present methods of manufacturing concrete will come from a better understanding of the very injurious effect of excess water and a saner practice in proportioning this important element of the mix.

*From *Concrete Highway Magazine*.

THE ROADS.

PRESENT AND FUTURE PROBLEMS.

In their report for 1916-17 the council of the Roads Improvement Association urge that one of the chief aims of that body at the close of the war must be to press for the re-application of the proceeds of the petrol tax—which have been temporarily diverted by the Government for other purposes—towards the cost of road improvement and reinstatement.

Reference is also made in the report to the section of the Local Government (Emergency Provisions) Act, 1916, relating to the "issue of licences by local authorities for the running of any omnibus over any road which has not been regularly used for that purpose during two years prior to March 1, 1916." The council state that the efforts of some authorities to read into these provisions facilities to make traffic pay local fees or tolls for the use of the highways are causing the association considerable uneasiness, "as such a system of local tolls is likely to produce results contrary to the national interest."

Another matter of interest touched upon in the report is the recent decision affecting the responsibility of railway companies concerning the maintenance of bridges carrying public highways over railways. It will be recollected that it was held "that the railway company are only required to maintain these bridges in the condition of strength in relation to the traffic at the time they were erected." Commenting on this, the council say: "This decision raises a question of national importance, in view of the development of all classes of road traffic that has taken place since the majority of canal and railway bridges were constructed, and the time has undoubtedly now arrived when a radical change must be considered in the law relating to them. The value of the highway system of the country must not be permanently impaired by weak links over private property."

Prevention of Water Waste.—The waterworks engineer and manager of Swansea has reported that the ordinary domestic consumption of water in the town is from two to three times as much per head as that of other towns in the county. The Waterworks Committee have consequently given instructions for proceedings to be taken against persons wasting water, and failing to repair or notify defective fittings. Further steps are to be taken to cut off any person's water supply where that person has not repaired defective fittings.

Mediæval Craftsmanship. Messrs. B. T. Batsford will shortly issue "English Church Woodwork," a study in craftsmanship during the mediæval period, the text of which has been written by Mr. Frank E. Howard, the well-known archæologist of Oxford, while the illustrations are contributed by Mr. F. H. Crossley of Chester. The book is the first to present a full survey of its great subject, and is a reminder of the extraordinary achievements of English craftsmen in the design and carving of church fittings, an art in which it is scarcely too much to claim for England a supremacy during later mediæval times. The striking and varied beauty and masterly execution of this native work will prove remarkable and surprising even to those not ignorant of its merits. The large number of original illustrations from photographs are arranged in the endeavour to define the characteristics of the different schools of local design prevalent at the time, particularly in East Anglia, the Midland and the South-Western Counties, a fascinating subject which will repay further study and research.

MUNICIPAL PIG-KEEPING SCHEMES.

The special committee on pig-keeping of the Littlehampton Urban District Council have been authorised to allocate £20 to the Health Committee for the erection of two sties and the purchase of young pigs for fattening.

At the meeting recently of the Tilbury Urban District Council, the engineer and surveyor, Mr. S. A. Hill-Wills, submitted a copy of the Bognor Urban District Council's piggeries taken from THE SURVEYOR and estimated the cost of erecting one pair of breeding sties on the refuse destructor site, South Ward, at £60. The council decided to refer the matter to a special committee.

The superintendent of the Veterinary Department of the Birmingham Corporation, Mr. John Malcolm, in a useful leaflet for intending pig-keepers suggests that prospective buyers who lack practical experience should consult a farmer, pork-butcher, or other expert if possible, so as to secure the most suitable pig for their purpose, and reminds those who desire to erect a pigsty less than twenty yards from a house or road that they should write to the inspector of nuisances, so that an inspector may view the site and, if it is approved, grant permission to erect the sty. The essential points in the corporation by-laws that pigs shall be kept so as not to be a nuisance or dangerous to the health of the neighbourhood are pointed out, and instruction is given with regard to moving a pig and the feeding, illness, selling, and killing of the animal, as well as advice in respect to curing bacon.

The medical officer of the Willesden Urban District Council, Dr. Buchan, reported that from eight to nine tons of waste food was not being utilised, and the council decided (*a*) That the collection of waste food from hotels, public-houses, public institutions, eating-houses, greengrocers, and canteens, and similar large establishments, should be undertaken by the council; (*b*) that the council should enter into agreement with a pig-keeper for the utilisation of the food collected for the keeping of pigs or other animals on terms to be arranged; and (*c*) that, if required, some portion of the lands belonging to the council at the sewage farm, or elsewhere, should be rented to the pig-keeper on terms to be arranged, subject to the pig-sties being erected by the contractor. It was agreed that there would be no financial return for the work but that the expenditure incurred would help towards meeting the shortage of food supplies.

DRAINAGE WORKS AT NEATH.

THE RURAL COUNCIL AND THE L.G.B.

Arising out of a complaint by the Neath Rural District Council of drainage work at certain houses on the Aberpergwm estate, Glyn-Neath, the Local Government Board wrote that, having regard to the great need for economy and to the demand which exists for labour in connection with the war, it appeared to them that the present time was inopportune to request that the work should be carried out.

The chairman (Mr. W. B. Trick, J.P.) said the Board had been forcing them to carry out such work and now was turning round to delay the matter. The council felt that this was a matter of great urgency, and he suggested that a strong letter should be sent to the Board in reply.

Dr. Whittington (medical officer of health) said the position was in a dirty condition, and unless something was done before the hot weather came the results might be serious, and the Local Government Board would be held responsible.

The clerk was instructed to convey the feelings of the council to the Local Government Board.

Preliminary Town Planning Schemes.—It was agreed at the last meeting of the council of the Institution of Municipal and County Engineers that steps should be taken to confer with the Local Government Board with a view of preparing and submitting to the Government proposals providing that local authorities should be required to make preliminary town planning schemes for their respective areas, and to include the planning of main traffic roads, the fixing of building lines on new and existing streets, and the limitation of and build ing densities.

CULTIVATION OF LANDS ORDER.

THE POSITION OF PARISH COUNCILS.

In the House of Commons the President of the Board of Agriculture was asked whether he would consider the advisability of the Order of February 20th regarding the allotment of land to cultivators being extended to parish councils, in view of the fact that parish councils have lists of applicants for land and had no power to act.

Sir R. Winfrey, who replied, said the Cultivation of Lands Order, 1917 (No. 2), to which the question referred, was intended to provide for the cultivation of the vacant plots which were usually to be found in urban districts by means of the spare-time labour which was usually available in those districts, and it was particularly desired that any labour which could be more usefully employed in keeping in cultivation the lands already tilled should not be diverted to breaking up such plots. In a number of cases, however, where the district of a parish council was of an urban character, the Board had readily acceded to a request that they would delegate to the parish council similar powers to those conferred on urban district councils. Moreover, under the Cultivation of Lands Order, 1917 (No. 3), the County War Agricultural Executive Committees now had power to enter on land and arrange with parish councils, or other bodies, for its cultivation in small plots or otherwise, and this was the better course where, as was usually the case, a parish council had not the staff necessary for direct administration of the Order.

Valuable Sewage By-Products.—There was a time (says the *Leeds Mercury*) when the sewage problem at Bradford, in view of the presence in the trade effluent of wool suds, was looked upon as a heavy burden upon the city; but the remarkable development of grease extraction and the recovery of valuable by-products from the sewers have altered the situation. So much so that this year the Sewage Committee will not require any assistance from the rates. The rise in the value of grease has resulted in a revenue to the Sewage Department of £80 000 during the municipal year just closed.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. John S. Brodie, M.Inst.C.E., Borough Engineer and Surveyor, Blackpool.

METROPOLITAN DISTRICT.

A Metropolitan District meeting of the Institution of Municipal and County Engineers will be held at the offices of the institution to-day (Friday).

Programme.

6.30 p.m.—Meet at the offices of the institution, 92 Victoria-street, S.W.

Business:

1. To confirm minutes of previous meeting.
2. To discuss paper by Mr. Reginald Brown, entitled "The Dustbins of Greater London (The Problems connected therewith and Suggestions for their Solution)."

All members of the institution are cordially invited to attend.

N. Scorgie,
Hon. District Secretary.

Hackney.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Edward Whitwell, F.I.S.E., M.S.A., Engineer and Surveyor, Abersychan Urban District Council.

GENERAL MEETING IN LONDON.

At a general meeting of the Institution of Municipal Engineers to be held in London on June 6th, Mr. Reginald Brown, M.Inst.C.E., engineer and surveyor to the Southall-Norwood Urban District Council, will present for discussion a paper entitled, "House Refuse: Its Calorific Value and its Possibilities."

The chair will be taken at 6.30 p.m.

INSTITUTION OF CIVIL ENGINEERS.

"JAMES FORREST" LECTURE.

A special meeting of the Institution of Civil Engineers will be held on Wednesday next, the 2nd prox., at 5.30 p.m., when the twenty-fifth "James Forrest" lecture, "The Standardisation of Engineering Materials, and its Influence on the Prosperity of the Country," will be delivered by Sir John Wolfe Barry, chairman of the Engineering Standards Committee.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SEWAGE WORKS WATERMAN.—April 30th.—Brownhills Urban District Council.—Mr. J H. Shaw, surveyor, Council Offices, Brownhills, Staffs.

TEMPORARY SURVEYOR AND INSPECTOR.—April 30th.—Cheriton Urban District Council.—Mr. Arthur Atkinson, jun., acting clerk, Public Offices, Cheriton, Kent.

SURVEYOR AND INSPECTOR.—April 30th.—Luddendenfoot Urban District Council. £120 a year.—Mr. C. W. Moses, clerk, Council Offices, Luddendenfoot, Yorks.

INSPECTOR OF NUISANCES AND HIGHWAY SURVEYOR.—May 1st. Skirlaugh Rural District Council.—Mr. C. W. Hobson, clerk, 26, Lairgate, Beverley, E. Yorks.

ASSISTANT INSPECTOR OF NUISANCES.—May 1st.—Barnes Urban District Council. £100 a year.—W. T. Goodale, clerk, Council House, Mortlake, S.W. (14).

TEMPORARY ASSISTANT.—May 1st.—Engineer and surveyor's department. Finchley Urban District Council. 2½ guineas per week.—Mr. E. H. Lister, clerk, Council Offices, Church End, Finchley, N. 3.

ROAD FOREMAN.—May 2nd.—Jarrow Corporation.—Mr. W. J. Charlton, deputy town clerk, Jarrow.

SURVEYOR.—May 3rd.—Leyburn Rural District Council. £100 per annum.—Mr. C. E. Dixon, clerk, Leyburn, Yorks.

ASSISTANT.—May 4th.—Wednesbury Borough Surveyor's Department. Mr. T. Jones, town clerk, Town Hall, Wednesbury.

SURVEYOR'S TEMPORARY ASSISTANT.—May 7th.—East Barnet Valley Urban District Council. £100 per annum.—Mr. T. A. Buckley, clerk, Council Offices, New Barnet.

ASSISTANT COUNTY SURVEYOR.—May 12th.—Staffs County Council. £230 per annum.—Mr. James Moncur, M.INST.C.E., County Buildings, Stafford.

ROLLER DRIVER.—Staffs County Council. 33s. 6d. per week.—Mr. James Moncur, M.INST.C.E., County Buildings, Stafford.

WATERWORKS ENGINEER.—Swanage Urban District Council.—Mr W. H. Pearce, Town Hall, Swanage.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

LUDDENDENFOOT.—April 30th.—For the erection of burr wall, for the urban district council.—The surveyor, Council Offices, Luddendenfoot, Yorks.

WOMBWELL.—May 1st.—For material and labour required in the resetting of a bed of retorts at the gasworks, for the gas committee.—Mr. P. D. Walmsley, engineer, The Gasworks, Wombwell, Yorks.

Engineering: Iron and Steel.

BALLINAMORE.—May 3rd.—For the completion of the waterworks, for the rural district council.—Mr. J. A. Kiernan, solicitor, Ballinamore, Ireland.

MANCHESTER.—May 11th.—For the supply and erection of coal-conveying plant, for the Electricity Committee.—M.r J. L. Pearce, chief electrical engineer, Dickinson-street, Manchester.

MANCHESTER.—May 11th.—For the supply and erection of one hydraulic accumulator and electrically-driven ram pump, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall, Manchester.

Roads.

BATTERSEA.—April 30th.—For the supply of materials and works for resurfacing a roadway with asphalt macadam, for the borough council.—Mr. W. M. Wilkins, town clerk, Battersea, London, S.W.

ARGYLL.—April 30th.—For the maintenance of district roads, for the Ardnamurchan District Council.—Mr. J. Thomson, road surveyor, Strontian.

CROFT.—April 30th.—For loading stones, and for the supply of broken and unbroken whinstone, ironworks, slag and annealed slag, for the rural district council.—Mr. J. Hodgson, surveyor, North Cowton, near Darlington.

WINSFORD.—May 1st.—For the supply of 400 tons of granite macadam broken to pass 2-in. gauge, 200 tons of granite chippings to pass ¾-in. gauge, and 150 tons of granite chippings to pass ¼-in. gauge, for the urban district council.—Mr. J. Wilkinson, surveyor, Winsford, Cheshire.

SWANSEA.—May 1st.—For the execution of private street works, for the corporation.—Mr. J. Richard Heath, borough engineer and surveyor, Guildhall, Swansea.

HIPPERHOLME.—May 1st.—For the supply of 2½-in. tarred macadam, for the urban district council.—Mr. G. Wharton Thompson, engineer and surveyor, Council Offices, Hipperholme.

WINDLESHAM.—May 3rd.—For the supply of 400 tons of 2-in. broken granite, 100 tons of 1½-in. broken granite, 100 tons of ¾-in. dust and tar paving materials broken to 1⅜ in. and ⅜ in. respectively, for the urban district council.—Mr. E. T. Close, clerk, Council Offices, Windlesham, Surrey.

CRAMLINGTON.—May 5th.—For the supply of broken whinstone, tarred slag, slag chips, hire of 15-ton roller, and tar-spraying, for the urban district council.—Mr. W. J. Coulson, Council Offices, Cramlington.

FOLKESTONE.—May 7th.—For the supply of 2,000 tons of broken granite, to be delivered to Shorncliffe Station or Junction Station, for the corporation.—Mr. A. E. Nichols, M.INST.C.E., borough engineer, Folkestone.

ROMFORD.—May 7th.—For the supply of 450 tons of 1½-in. broken granite, 300 tons of ¾-in. clean granite chippings, and 14,000 gallons of distilled tar or other similar product, for the urban district council.—Acting Surveyor, Council Offices, Market-place, Romford.

SWANAGE.—May 7th.—For tar-spraying 27,000 super yards of carriageway, for the urban district council.—The Surveyor, Town Hall, Swanage.

LOCHABAR.—May 10th.—For the supply of road metal, for the district committee.—Mr. J. Schoolar, road surveyor, Fort William, Inverness.

WATERLOO.—May 10th.—For the supply of 2-in. broken granite, 1-in. to 1½-in. broken granite, tarred broken granite, ¾-in. limestone and granite chippings, ¼-in. limestone and granite chippings, stoneware pipes, leads and junctions, for the rural district council.—The Surveyor, Council Offices, near Ashton-under-Lyne.

WELLINGTON (SALOP).—May 15th.—For the supply of 50 tons of tar, suitable for painting, to Road Board's specification, for the urban district council. Mr. Geo. Riley, engineer and surveyor, Wellington.

HALIFAX.—May 21st.—For private improvement works, for the Highway Committee.—Mr. J. Lord, borough engineer, Town Hall, Halifax.

TARPORLEY.—For the supply of granite, macadam and chippings, for the urban district council. Mr. E. Cawley, clerk, Tarporley, Cheshire.

Sanitary.

WICKLOW.—May 1st.—For scavenging the urban district, for the urban district council.—Mr. F. W. MacPhail, clerk.

GODSTONE.—May 9th.—For certain supplementary works for sewage disposal to be carried out at the present disposal works at Limpsfield and Oxted, for the rural district council.—Mr. H. Howard Humphreys, 28, Victoria-street, Westminster, S.W.

Miscellaneous.

TEDDINGTON.—April 30th.—The urban district council invite tenders for their Shand, Mason and other steam fire engine.—Mr. Marshall Hainsworth, Surveyor, Public Offices, Teddington.

GLASGOW.—May 1st.—For the supply of stained pipes and tubes, iron pillars, iron gas fittings, cloth work, cloths and chamois skins, paints and oils, for the Lighting Department, 20, Trongate, Glasgow.

BRIGHTON.—May 10th.—For the supply of Portland cement, for the corporation.—Borough Surveyor, Town Hall.

Scottish Housing Commission's Report.—Answering a question in the House of Commons, Mr. Munro, Secretary for Scotland, stated that the work of drafting the report of the Scottish Housing Commission was proceeding as rapidly as possible, but he was not prepared to name a definite date for its completion.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BARTON-UPON-IRWELL.—Accepted for the supply of materials, for the rural district council:—

Macadam, 2-in. and ½-in., delivered at Urmston and Flixton: Penmaenmawr and Welsh Granite Company, 3s. 10d. and 3s. 6d. per ton; Pwllheli Granite Company, 7, Chapel-street, Liverpool, 12s. 6d. per ton.

6-in. grit setts, delivered at Urmston, Flixton and Swinton: Rich. Wild, Fletcher Bank, Ramsbottom, 16s. 6d. and 17s. per ton.

12-in. by 7-in. kerb, delivered at Urmston, Flixton and Swinton: Thos. Windle & Son, Scout Quarries, Waterfoot, 3s. 10d. and 4s. 8d. per yard.

6-in. kerby setts, delivered at Urmston, Flixton and Swinton: Thos. Windle & Sons, 19s. 3d. and 18s. 6d.

Street-sweeping brushes: Manchester and Salford Blind Aid Society, Ardwick-street, Manchester, No. 1 quality, 9s.; No. 2 quality, 2s. set of new brushes (6); 55s.; refilling old stocks, 5s. per set.

Sett-crossing setts, delivered at Urmston, Flixton and Swinton: Thos. Windle & Sons, 24s. and 24s. 3d. per ton.

Sawn flags: Thos. Ratcliffe, Lee Quarries, Bacup, 5s. 6d., 5s. 3d., and 5s. 9d.

Stoneware pipes: John Crankshaw & Co., Harwich, 10s. 11½d., 7s. 6d., 4s. 5½d., 2s. 6½d., 1s. 5d., and 11½d. per yard.

BUCKIE.—The following tenders have been accepted by the Town Council:—

Glenny, steam rolling at 30s. per day, and 15s. per day if standing idle.

Messrs. Scottish Granite Company, Limited, 100 to 500 tons of grit, at 12s. 9d. per ton, and 60 tons of grit at 12s. 6d. per ton.

D. J. Fraser, 500 tons of stone at 7s. per ton, and 50 tons of sand at 4s. 6d. per ton.

HAILSHAM.—Accepted for the supply of materials, for the rural district council:—

Messrs. Redman Limited, for ragstone at Heathfield Station, at 1s. 3d. per cube yard, and granite at Pevensey Station, at 2s. 3d. per ton.

Messrs. Constable Hall & Co., for ragstone at Hailsham Station, at 2s. 3d. per cube yard.

The Kemnay and Stanton Granite Company, Limited, for screenings and chippings at per ton nett, at Heathfield, 1s. 7d. and 1s. 3d., Hurstpierpoint, 1s. 3d. and 1s. 4d., Hellingly, 1s. 10d., Hailsham, 1s. 11d. and 1s. 7d., Polegate, Berwick, 1s. 9d. and Pevensey for chippings only, at 1s. 11d.

PRESTON.—For the supply of materials, for the urban district council:—

Granite Company: Y granite at 1s. 6d., XX at 1s. 6d., XXX at 1s. 6d.

Holwell Iron Company, Ltd.: [illegible] 1s. 10d., Wash Dykes-road, [illegible] 2s. 3d., F Grist, Lincoln-road, 1s. 4d., [illegible]-road, 1s. 6d. For day work the [illegible] 1s. 6d. per hour for long day, and 8s. short day, [illegible] accepted.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

APRIL

27.—Institution of Surveyors and County Engineers: Metropolitan Branch: Meeting, 92, Victoria-street, S.W., 5 p.m.

MAY.

2. Institution of Civil Engineers: Sir James Wolfe Barry on "The Standardisation of Engineering Materials and its Influence on the Trade and Prosperity of the Country" ("James Forrest" Lecture). 5.30 p.m.
8.—Royal Sanitary Institute: Mr. C. H. Cooper, borough engineer and surveyor, of Wimbledon, on "Refuse Collection and Disposal." 6 p.m.
17.—Institution of Electrical Engineers: Annual General Meeting. Institution of Civil Engineers, Great George-street, Westminster.

JUNE.

1. Town Planning Institute: Adjourned discussion on Mr. Rees Jeffreys' paper, "Road Construction and Improvements by Means of Town-Planning Schemes."
6.—Institution of Municipal Engineers: General Meeting in London, Mr. Reginald Brown, M.Inst.C.E., on "House Refuse: Its Calorific Value and its Possibilities." 6.30 p.m.
9. Institution of Municipal and County Engineers: Eastern Sub-District (Suffolk, Norfolk, and Cambridge) Meeting at Ely.
21-22.—Incorporated Municipal Electrical Association: Annual Meeting. Institution of Civil Engineers, Great George-street, S.W.
28-30. Institution of Municipal and County Engineers: Annual Meeting at Hastings.

APPOINTMENTS OPEN.

ASSISTANT COUNTY SURVEYOR.

The Staffordshire County Council invite applications for the position of Assistant County Surveyor. The appointment will be temporary and for the duration of the war. Applicants must be ineligible for military service and thoroughly conversant with bridge work and the work of a County Surveyor's office. The salary will be at the rate of £230 per annum, and the person appointed will be expected to provide and use a motor-cycle, towards the upkeep of which the Council will allow 2½d. per mile. Applications, stating age and experience, must reach the undersigned not later than 12th May, 1917.

JAMES MONCUR, M.Inst.C.E.

County Buildings,
Stafford. (3,394)

ROLLER DRIVER.

The Staffordshire County Council invite applications for the position of Roller Driver in the Leek and adjoining districts of the county. Wages 33s. 6d. per week, including war bonus. Applications, stating age and experience, to be addressed to James Moncur, M.Inst.C.E., County Buildings, Stafford. Applicants must be ineligible for military service.

County Buildings,
Stafford,
23rd April, 1917. (3,393)

EAST BARNET VALLEY URBAN DISTRICT COUNCIL.

SURVEYOR'S TEMPORARY ASSISTANT.

The Council invites applications from men, ineligible for military service, for the position of Surveyor's Temporary Assistant, at a salary at the rate of £100 per annum.

Applicants must have had previous experience in the work of a municipal surveyor's office.

The appointment will be terminable by one calendar month's notice on either side. Applications, endorsed "Surveyor's Assistant," stating age, experience, present employment, reason why ineligible for military service, and what documentary or other evidence can be submitted in support thereof, and accompanied by copies of two recent testimonials, should reach me not later than 4 p.m. on Monday, the 7th May.

T. A. BUCKLEY,
Clerk to the Council.

Council Offices,
New Barnet.
April 24, 1917. (3,398)

TENDERS WANTED.

BOROUGH OF FOLKESTONE.

Tenders required for supply of 2,000 tons of Broken Granite, to be delivered to Shorncliffe Station or Junction Station.

Particulars may be obtained from the undersigned. Tenders to be sent in by 10 a.m. on 7th May, 1917, to Borough Engineer's Office, Folkestone.

A. E. NICHOLS,
Borough Engineer.

(3,395)

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Arterial Roads and Town Planning.—II.

In view of the importance of the subject with which it deals, we make no apology for returning this week to the consideration of Mr. Rees Jeffreys' paper on "Road Construction and Improvement by means of Town Planning Schemes." That part of the paper with which we dealt in our last issue was concerned in the first place with the legal question of whether the machinery of the Town Planning Acts can be used to secure the sites for arterial roads in advance of building development. To this question an affirmative answer was returned, and it was further shown that the course indicated renders it possible for roads to be constructed or widened at a less cost to local authorities than by the use of any alternative powers. It is evident, however, that in almost every case an arterial or through road, properly so called, will necessarily pass through the areas of several local authorities. Mr. Jeffreys therefore next discusses the question of co-operation and the provision of the cost of special works, such as bridges, &c., testing the possibility of such co-operation by reference to a number of hypothetical cases. In the final part of his paper Mr. Jeffreys discusses three main difficulties which he sees in the way of carrying into effect the proposal to utilise the powers given by the Town Planning Act for the purpose of arterial road construction and improvement. We will deal with these in order. First, it is suggested that there is no inducement for men with the necessary qualifications to initiate and carry out such schemes, and that there is no available organisation for training and employing such men. The remedy proposed is none other than the formation of "an official or semi-official department attached to the Local Government Board for the training and employment of practical town-planners, who shall be available for employment by local authorities. . . ." We confess that we are not much impressed either with the alleged difficulty or with the proposed remedy. In the course of a fuller explanation which follows it appears that the proposal is really one for setting up a Town Planning Commission, with power not only to send out paid experts as consultants, but also to initiate schemes which affect more than a single area. We are at the moment only dealing with the first object of the proposed commission. There can be no doubt that, owing to a variety of causes, town planning has made but moderate progress since the passing of the Act of 1909. The work that has been accomplished, however, has been in no small measure due to the energy and initiative of municipal engineers, and in our view they are quite capable of producing schemes, with outside expert advice on special questions and in special cases, particularly if regulations and restrictions could be simplified. The second of the difficulties which Mr. Jeffreys discusses is that of finance, and particularly the financial obligations that would be cast upon local authorities in providing the cost of special works, and the cost of road construction in advance of building development. This raises the familiar question of local liability for roads which under modern through-traffic conditions may be more than local or even national in character. It is only fair therefore that part at least of the burden should be borne either by an enlarged rating unit or, alternatively, by the State. The third and last of the difficulties discussed is that arising from the divided interests of adjoining authorities. It is proposed to meet this by the establishment of a permanent commission, whose duty would be, after due inquiry and negotiation with all the interests concerned, to propose to the Local Government Board such alterations and adjustments in the duties, powers, and areas of particular local authorities as special local conditions and changing circumstances may require. The central proposal of Mr. Jeffreys' paper, however, is for the establishment of a Town Planning Commission, with power to initiate schemes, and, when necessary, to execute them; and with sufficient funds to give assistance where assistance is required. This suggestion is the outcome of a rather pessimistic survey of the present situation and a genuine desire to stimulate the present rate of progress. As firm believers in the town planning idea, we are glad that such a suggestion has been put forward by such an authority as Mr. Rees Jeffreys for consideration and discussion, and we shall be interested to learn the views of our readers in regard to it.

* * *

Engineering Education.

In delivering his inaugural address as president at the meeting of the Institution of Mechanical Engineers recently, Mr. Michael Longridge exercised a sound judgment in departing somewhat from conventional lines, and in speaking principally of problems arising out of the war which affect the engineering profession and industry. Of all the lessons we have to learn from the war, none is perhaps more important than that the country will depend for its future security and prosperity upon the engineering industry. There will be no lack of competition. Germany, with her usual foresight, is said to be organising her industrial resources to the highest possible state of efficiency. America, our new Ally, has acquired enormous riches, and will in the future be a most formidable competitor in the world's markets. Neutral nations, too, are growing rich, and even the smaller ones will have to consider more in the future than in the past. How, then, can we meet the situation that will necessarily arise? The answer to this question may be summed up in the two words "Education" and "Organisation." As is the case with

so many of our institutions, our present system of technical education has grown haphazard by a series of adaptations of immediate pressing needs. In the early days of British industrial prosperity the apprenticeship idea was supreme. Gradually, however, technical colleges were instituted, and some of the newer Universities established Chairs of Engineering. A great step forward was made in 1887, when the Livery Companies in London started the City and Guilds Central College. Finally, in recent years, not only have engineering courses been provided in most of our older Universities, but a number of modern Universities have sprung into existence in which scientific education takes a leading place. The result, however, has been rather to sever practical workshop training from the education of the classroom, and the problem of the future is to define a system which will be a judicious combination of the two. This education has been effected much more satisfactorily in the past as regards those who are preparing to occupy positions as scientific advisers or managers and business organisers. The education provided for craftsmen, however, is still more unsatisfactory. The principal defect probably is that theoretical training in the classroom is only to be obtained at evening classes, and that consequently a fresh brain is never brought to this work. We agree entirely with Mr. Longridge that either the age for leaving school will have to be raised or some scheme devised for providing technical instruction in the schools during working hours. Mr. Longridge outlined a scheme by which two classes of institutions giving technical instruction should be established—first, technical colleges of university rank providing two courses, one for scientific advisers and designers, and the other for managers and business organisers; secondly, technical schools, again having two courses, one adapted to the requirements of men likely to become foremen or supervisors, and the others for those likely to remain as manual workers. While we are in general agreement with the scheme thus outlined, it is, of course, impossible to express a considered opinion before the whole question has been thoroughly investigated and reported upon by a competent committee of experts. All we desire to urge now is that the question is of such vital importance as to merit the serious attention of the Government. Mr. Longridge was, naturally, speaking more particularly of the education of mechanical engineers, but much of what he said applies with almost equal force to the education of municipal engineers. The articled pupil in a municipal office is still too often expected to spend a long day in the office and to acquire his theoretical training either by attendance at evening schools or by cramming with a coach in office hours. We cannot help thinking that a very satisfactory result would be obtained by a rather longer term of pupilage than is at present customary, during which the student would devote a fair proportion of his daily working hours to attendance at a technical college.

* * *

Multiple-Arch Dams.

Questions most difficult to answer are often asked by the student or layman possessing some scientific knowledge. One of these questions relates to retaining walls and dams. If the principle of the arch is useful for vertical loads, why is it not applied against horizontal pressures, such as that exerted by water? It is certainly difficult to give a satisfactory answer to such a question. At present, a masonry dam merely opposes its dead weight against the overturning action of the water; the principle of the arch, or even of the girder, does not come into consideration, and one feels instinctively that the method is crude and capable of improvement. It is true that the principle of the single arch spanning a valley has been adopted, and that the use of reinforced concrete has to some extent introduced the principle of the girder and cantilever. In such examples we see the gradual evolution of the dam, starting from the bank of earth or mass of masonry and advancing towards a structure of greater and more certain strength and economy. A further step, and one of very great importance, is to be observed in the recent design and construction of the multiple-arch dam. Several dams of this type have been built in America, and have so far given very satisfactory results, and one of the latest papers read before the American Society of Civil Engineers describes the design and construction of two multiple-arch dams built in 1915 and 1916. The author, Mr. L. R. Jorgensen, has not only given a very full description of this work, but he has dealt very fully and clearly with the whole question of theoretical and practical design, giving calculations and exact detail drawings. The importance of the subject, taken together with the clearness with which it is described, make his paper—the opening instalment of which will be found in our issue of last week—peculiarly valuable to the water engineer.

The factor of safety of an ordinary earthwork dam is certainly unknown, and under normal conditions such dams frequently become unsafe, as may be seen from the many failures. It is certain that the nearer we approach to an exact knowledge of the strength of our work the less will be the likelihood of accident. The possible troubles due to unexpected overflow are practically absent in the case of the newest type of dam; such overflows would not hurt the dam or its foundations, unless they occurred over an extended period. The danger of upward pressure of water under the foundation is also practically removed. This is not to say that we have before us the solution of all difficulties. We are at present limited as to height, but the author is of opinion that a multiple-arch dam of small or medium height (less than, say, 100 ft.) will cost less to construct than the ordinary dam formed of loose rock. Again, we are limited to a great extent by the nature of the foundation, for it is clear that where the load has to be concentrated on to a much smaller area a firm foundation is more essential; but, on the other hand, it is generally easier to secure a good foundation for a series of piers than for the much larger area occupied by the older type of dam. As the dam increases in height these piers or buttresses must be relatively much larger, so that after a certain height is reached it is found best to revert to the single-span arch dam. Considering the troubles which are continually occurring with dams of all types, and the elementary character of the design in most cases, it is evident that there is room for considerable improvement. Mr. Jorgensen's work is therefore a very valuable addition to our knowledge of the subject, and we commend its study to all water engineers.

* * *

Refuse Collection and Disposal.

The excellent attendance and discussion at the meeting of the Metropolitan District of the Institution of Municipal and County Engineers on Friday last afforded ample evidence of the interest that is being taken in the questions of house refuse storage and disposal. The subject was introduced in a very able paper by Mr. Reginald Brown, who took as his title "The Dustbins of Greater London," and succeeded in infusing no little interest into a subject which has few inherent attractions, but is of considerable importance, both sanitary and financial. In the course of the paper and discussion a number of interesting questions were raised. And first, as to the method of storage before collection. The

movable galvanised iron bin, which used to be considered the last word in devices for sanitary storage, came in for a good deal of criticism. Two alternative suggestions were made. First, that the refuse should be stored in light receptacles, of such a character that they could be removed and destroyed with the refuse itself. This would no doubt be an ideal method, but, unfortunately, it is hardly practicable, particularly at the present time, on the score of expense. Alternatively, Mr. Brown suggested a bin of the present shape, but consisting of a skeleton frame only, and having as a lining a cheap canvas bag dressed with rot-proof and waterproof composition, and hung on to the top rim of the bin by means of strong metal hooks. At each visit of the dustman the full canvas bag is lifted bodily out of the tin, tied round the top by means of an attached cord, and removed entirely from the premises, a clean one being put in its place. This idea has certain obvious advantages, such, for example, as absolute cleanliness, both in the house and in the process of removal. On the other hand, there would be some difficulty and unpleasantness in handling in wet weather; while experience has also shown that they are liable to harbour maggots. Mr. Willis said that he had actually tried these canvas bags, but had found difficulty in getting people to use them. Another point that emerged from the discussion was the difficulty that had been experienced by members in comparing the various statistical figures appearing in the paper, owing to lack of uniformity in the methods adopted by the several districts in setting out the information supplied. This was very significant as showing the value of the standardised forms of return that have been and are being published by the institution. A good deal of discussion also centred round Mr. Brown's patent process for utilising house refuse as fuel briquettes made by reduction, compression, and impregnation. Mr. Brown, acting under advice, was not able to give full details of the process; but in these days of waste utilisation there can be no doubt that it is far preferable to turn refuse into fuel rather than to burn it in a destructor, if such a desirable end can be attained.

* * *

Skilled Roadmen and the Army.

The military representatives who attend the various Tribunals are charged with a function that, while obviously necessary and important, is frequently thankless and sometimes unpopular. They do this, as a rule, with surprising ability, considering the limitations with which the military expert is traditionally credited; and if the pressing needs of the Service which they represent are remembered, allowance will be generously made for the rhetorical keenness, not to say bluntness, with which they seek to gain their points. Yet they are sometimes placed at a disadvantage, not presumably from any lack of capacity on their own part, but because their brief has been indifferently prepared for them. In plain language, they are sometimes wofully deficient in the information which ought to be at their service if they were fully and properly instructed. A somewhat noteworthy instance of this occurred at the Halesowen Tribunal recently, of which a report was given in last week's SURVEYOR. The county surveyor made an appeal for a steam-roller driver who after being rejected was later classified as B2 and kept at Norton Barracks, Worcestershire. As he was found to be "kicking his heels about there like a good many more," and as drivers were badly needed, the county surveyor obtained his discharge. The man was now called to the Colours again, and if his services were lost the roads of the locality would have to be neglected. The county council, it was pointed out, had the utmost difficulty in securing men, and the roads were getting into a deplorable condition. Upon this the military representative suggested that drivers were urgently needed in France. It was merely a suggestion, but it was quite erroneous, as appeared from the unchallenged authority of the county surveyor, who pointed out that one of the most competent steam-roller drivers in the employment of the county authority who volunteered for such work in France was doing navvy work. There were plenty of drivers and foremen at the front, and it was causing a deal of dissatisfaction, owing to the fact that these men were being put to do labouring work. This is clearly a regrettable state of things, for it means a serious loss of essential man-power to the road authorities, who are already at their wits'-end in so far as certain classes of skilled labour are concerned. In such circumstances, where there is manifestly a surplus of men in France, it ought not to be a very difficult matter to arrange for a scheme of substitution. Meanwhile, to continue calling for more men of the class indicated is alike shortsighted, wasteful and unnecessary.

* * *

Food Restrictions.

On Wednesday of last week Dr. M. S. Pembrey gave at the Royal Sanitary Institute a lecture which he called "The Restricted Supply of Food: Its Relation to Health and Efficiency." Some of us who listened to this lecture began to wonder whether Dr. Pembrey realised that we are at war, and that if we are not to be starved every effort must be made to restrict our food consumption for the next few months, and possibly for a longer period. Dr. Pembrey began with some allusions to the value of food and the necessity of a certain amount of calories for the maintenance of life and strength. He made our mouths water to get at these calories, but said nothing as to how they are to be got. He proceeded to point out that whereas our sailors and soldiers are treated to about 4,000 calories a day in their rations, we poor civilians are asked to put up with only 2,000 a day, and he more than hinted that this is not enough. But does Dr. Pembrey realise that in all probability if our sailors and soldiers had not received this amount of food neither he nor his audience would have been where they were last week? He gave us a long homily on infantile mortality, the present hobby of the doctors, which would have been quite appropriate in times of peace, and he made the astounding statement that women would be better engaged in suckling babies than in war-work! One was almost tempted to ask him what would become of the babies if the Germans landed on our shores. He proceeded to tell us that excessive eating would not make us fat if we took enough exercise, and in proof of this pointed out that animals do not put on flesh whatever quantity of flesh they eat. No wonder that Captain Bathurst, who was present, and who spoke splendidly, asked us not to remove our "In honour bound" cards. Finally, Dr. Pembrey attacked the Government for not stopping the brewing of beer in order to liberate barley for bread, and hop fields for the growing of foodstuffs generally. He suggested that land should be commandeered by the Government for the feeding of herds of State milch cows, in order to supply cheap milk, and he added that there are thousands of racehorses which if slaughtered would permit of the oats they eat being turned into porridge for the people. All this was very right and proper, but exceedingly controversial and ill-fitted for a Health Institute, and for an audience who were desirous of helping their country in this hour of need, and were hopeful of receiving some hints and practical suggestions on food economies. Some of us felt when the lecture was over that whereas we had expected bread we had been given a stone.

Multiple-Arch Dams.*

By L. R. JORGENSEN, M.AM.SOC.C.E.

[*Continued from last week.*]

As dams are generally built during the summer months it is only logical to assume that after their completion the individual arches are under tensile stress most of the time when the reservoir is empty, and decidedly so if it is empty during the cold season. The reinforcement in the arch therefore has been placed with the sole purpose of taking up these tensile stresses, which reach their maximum value near the down-stream face at the crown, and near the up-stream face of the abutments, under the conditions just stated. From the drawing at the left of Fig. 4 it will be seen that the reinforcing steel is placed at a distance equal to one-fourth of the total arch depth from the respective faces subject to tensile stresses, at the crown and at the abutments. The quantity of steel in the arch is perhaps not entirely sufficient to take care of the maximum contraction due to temperature drop, but it is believed that if [illegible] cracks develop, the presence of the reinforcement will cause them to be minute and well distributed, and that, when the structure becomes heated the cracks will close tight. It was not deemed advisable to put in the arches more steel than that shown by Fig. 4, for the reason that it is of comparatively little use when the reservoir is full. It must be kept in mind that a large change in temperature is not likely to occur suddenly, as a time element of perhaps weeks or months is generally interposed between the occurrence of maximum and minimum temperature in a dam body. This time factor can be expected on, to some extent, to prevent or eliminate temperature cracks. It gives the material of structure time to adjust itself to the new conditions (unlike in warmer concrete).

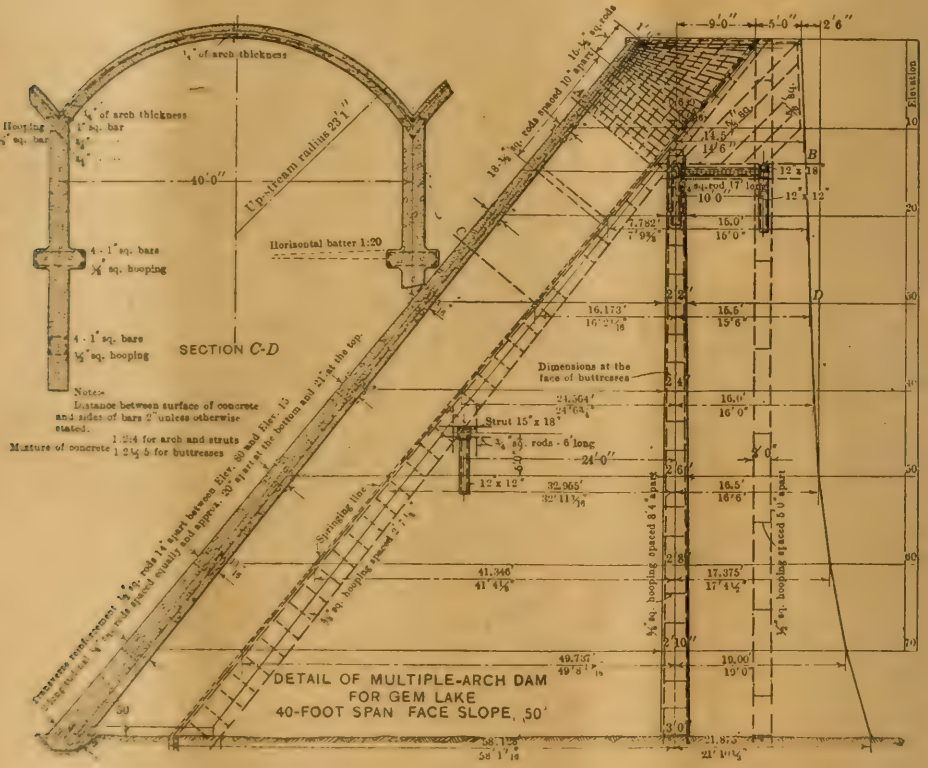


Fig. 4.

The Stability

After the foregoing have been given some preliminary discussion, the stability of the whole structure can be investigated, most conveniently by a graphical method, as shown by Fig. 6, representing a section through the crown of the arch. To facilitate the investigation the dam is divided into horizontal sections, 10 ft. apart in elevation, and the forces acting on and above each section are shown to scale in the location and direction in which they act.

The most important force acting on the structure is the water pressure, and this, as usual, is assumed to be concentrated in a horizontal plane which is two-thirds of the total depth below the water surface.

The horizontal plane in which the water pressure is assumed to be concentrated intersects the up-stream face along an elliptical curve. The point of application of a single force, representing the water pressure on one total span of 40 ft., coincides with the centre of gravity of this ellipse, at least, so long as the water pressure does not penetrate the up-stream face skin, such as plastering, &c.

Due to the fact that the arches have been given a slope of 50° with the horizontal, the water pressure will have a vertical component =

$$\frac{\text{horizontal component.}}{\tan.\ 50°}$$

To a very great extent the stability of the dam depends on the presence and action of this component, as it tends to hold the structure firmly down on its foundation.

The point of application of the water pressure, as already stated, is taken at the centre of gravity of the ellipse. From the crown this is a little more than one-third of the total distance $\left(\frac{1}{3} + 5 \text{ per cent for present conditions}\right)$ between the crown and the springing line.

Considering first the upper 10 ft. of the dam, the horizontal plane in which the water pressure can be assumed to be concentrated is at a distance of $\frac{2}{3} \times 10$

* From a paper presented at a meeting of the American Society of Civ. Engineers [illegible] April 18th. "Proceedings," vol. xliii., p. 492.

from elevation 0 downward, with the water surface at elevation 0, and the point of application, a, of the single force is—

$$\left(\frac{1}{3} + \frac{5}{100}\right) \frac{11{\cdot}55}{\sin 50^\circ} = 5{\cdot}78 \text{ ft.}$$

from the crown, measured horizontally.

The horizontal water pressure due to the 10 ft. of water on the 40-ft. span is—

$$\frac{0 + 625}{2} \times 10 \times 40 = 125{,}000 \text{ lb., or } 62{\cdot}5 \text{ tons.}$$

The vertical water pressure is equal to $\frac{62{\cdot}5}{\tan 50^\circ} = 52{\cdot}5$ tons. This latter force is now combined with the portion of the weight of the arch acting vertically. The weight of the arch above elevation 10 is equal to its volume in cubic feet multiplied by the weight of 1 cub. ft. The centre of gravity of the section—a trapezoid—is found and the centre of gravity b, of the whole arch is then taken to coincide with the centre of gravity of an ellipse through the centre of gravity of the section, in the same manner as explained previously for the water pressure. The weight of the arch is now combined with the vertical component of the water pressure, and the location of their resultant is found by taking moments around either point, a or b. The numerical value of the resultant is equal to the sum of the two forces, $52 + 52{\cdot}5 = 104{\cdot}5$ tons. Taking moments around the point, a, and scaling the distances, preferably on the sloping line between a and b for greater accuracy, we have the equation $\frac{52 + 2{\cdot}75}{104{\cdot}5} = x$ $= 1{\cdot}367$ ft., giving the location of the resultant at a point 1·367 ft. from a along the line between a and b. The weight of the buttresses (above elevation 10) assumed to be concentrated in the centre of gravity, d, is calculated to be 14·5 tons; it is combined with the vertical load of 104·5 tons on the arch, in the same manner as shown previously, by taking moments around any point, say c. The location of the resultant is found to be at e, and its value is $104{\cdot}5 \times 14{\cdot}5 = 119$ tons. This represents the total vertical force, both as to size and location.

This force is now combined with the horizontal water pressure of 62·5 tons, and the resultant is drawn. It is the purpose of this diagram, Fig. 6, to give the value of the resultant of all forces, and to establish the point of intersection, g, between this resultant and the base, in this case at elevation 10.

For convenience, the distance from e to f representing the total vertical force of 119 tons, may be measured, and the distance, f-g, representing the 62·5 tons horizontal water pressure, may be set off on the base to the same scale.

Consider next the portion of the dam above elevation 20 as a whole. The place of application of the concentrated water pressure is at a distance of $\frac{2}{3}\frac{0}{1} + 20$ ft. below elevation 0, and the point of application of a single force representing the water pressure on the 40-ft. span is located the same as before, 5·78 ft. from the crown toward the springing line, measured horizontally. The vertical component of the water pressure $= \frac{\text{horizontal component}}{\tan. 50^\circ}$ acting on the arch between elevations 0 and 20, is now combined with the weight of the arch lying between elevations 0 and 20, and their resultant is drawn in the correct location, found by taking moments as shown previously. This resultant is again combined with the weight of the portion of the buttress lying between elevations 0 and 20. The shape of the buttress is taken as that of an obelisk, and its volume and the location of the centre of gravity are found from ordinary rules applying to such bodies. The weight of the struts and counterforts is to be added to the weight of the buttress, whereby the location of the centre of gravity might be slightly changed.

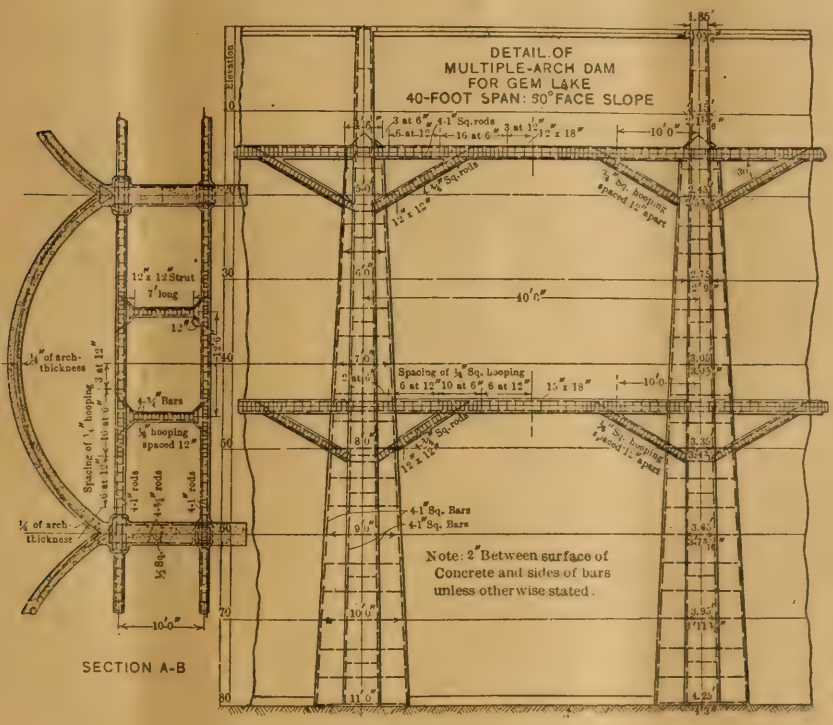


FIG. 5.

The resultant of all vertical forces acting on the dam above elevation 20 can now be found, both as to size and location, and combined with the horizontal water pressure, whereby the point of intersection of the resultant with the base at elevation 20 is determined.

The same method of procedure is followed for the remaining portion of the dam, each time taking the base 10 ft. lower than in the preceding calculations, and the whole diagram, Fig. 6, is completed. If, now, the centre line of the buttress, and also the two lines representing the middle thirds, are drawn, this diagram will point out very clearly whether or not the load is distributed economically on the buttress. For maximum economy, the resultant of all forces should intersect the base in the centre line of the buttress; then the load will be distributed uniformly over the whole base. Toward the top this is not quite possible, and is not important, as the material there cannot be stressed very highly at any rate; but, toward lower elevations, the down-

strata slope of the buttress should be shaped so as to conform with this condition, viz., the resultant intersecting the base in the centre line, or approximately in the centre line, of the buttress. The total vertical load on the section shown in Fig. 6 is seen to be 6,232 tons, and the horizontal water pressure, 5,062 tons, is at a 40-ft. span. If the co-efficient of friction is taken at 0·75, it is seen that the actual shear along the base amounts to only 5,062 − 6,232 × 0·75 = 313 tons. There is considerable steel in the section to help take up this shear, and therefore it was not deemed necessary to eliminate the shear entirely. There is no hydrostatic uplift to amount to anything acting on a dam of this type, and water could hardly find its way to lubricate the surfaces of possible cracks in the buttresses. Wherever it would be desirable to eliminate the shear entirely, the face slope should be made flatter, say 45, instead of 50 degrees. This, of course, adds to the material required for construction, but is the cheapest and best way of accomplishing the result.

Some difference of opinion may well exist as to the actual stress per square unit of area of the buttress at any horizontal elevation. The loads per buttress

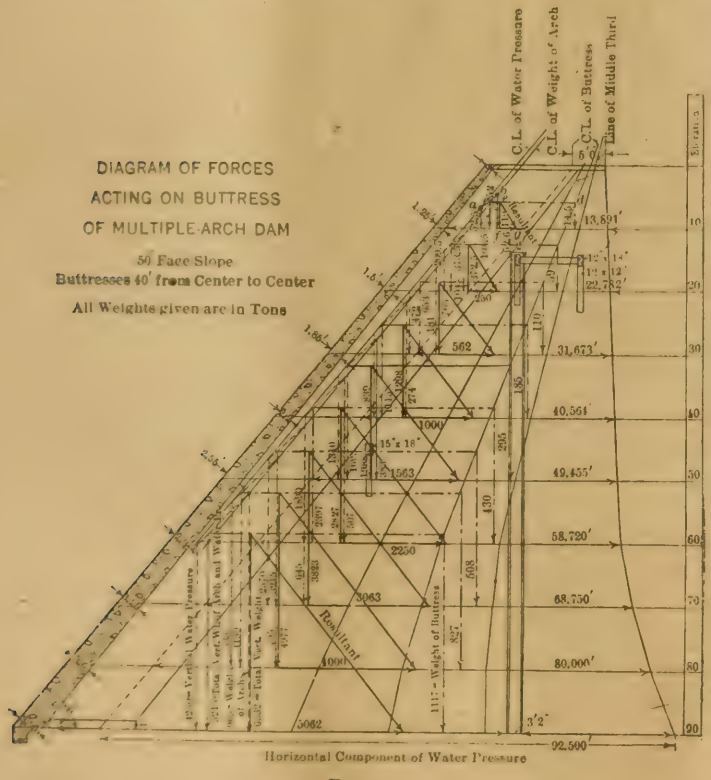


FIG. 6.

are given on Fig. 6. For instance, at elevation 80, the vertical load is seen to be 4,977 tons, and the horizontal load 4,000 tons. As the horizontal area is 320 sq. ft., the unit vertical stress should $\frac{4,977}{360} = 13{\cdot}82$ tons per sq. ft., or 192 lb. per sq. in. The shear would be a little more than friction alone would take care of, but steel is provided for the remainder. The resultant of the two forces (horizontal and vertical) intersects the base 2 ft. down stream relative to the centre line, but on account of having the counterfort 20 sq. ft. at the nib of the centre line also, the stress is actually distributed uniformly. Now, if, instead of the two principal forces, their resultant is used, assuming it as acting on a number of steps perpendicular to the direction of this force (the resultant), the apparent unit stress will be much higher. Thus, the resultant (6,385 tons) acting on an area equal to the sum of all the steps (320 × sq. ft. + 2 × 20 sq. ft.) will produce a compression of $\frac{6,385}{360} = 22{\cdot}8$ tons per sq. ft., or 317 lb. per sq. in.

There is a great difference between 192 and 317 lb. per sq. in. The actual unit compression will be somewhere between, undoubtedly depending on the relative value of the modulus of elasticity of the concrete for compression and for shear. It is seen that the first method, using the principal forces, gives the maximum possible shear that could occur, and that the other method gives the maximum possible unit compression that could occur. None of these methods is very satisfactory, as none fixes the absolute value of stress within narrow enough limits, but the writer knows of no better at present.

The reinforcing steel embedded in the buttress is put there for different purposes. Along the up-stream slope, the triangular steel construction shown in Figs. 4 and 5 ties the adjacent arches into the buttress. This is desirable on account of the fact that, in order to facilitate construction, the buttresses are built first, and the arches later. The hooping that interconnects the different bars is simply left protruding through the concrete of the buttress at the time this is built. Should one arch fail, this triangular girder would immediately take up the unbalanced thrust and prevent adjacent arches from collapsing, and this is its principal duty. Besides this, however, the steel is active in preventing cracks in the buttress and in taking up some shear. Toward the down-stream edge of the buttress four vertical rods are embedded in the concrete for the purpose of stiffening it, preventing cracks, and taking care of wind pressure. Toward the middle portion reinforced counterforts are constructed for the same purpose. These are still more effective in accomplishing this, due to the greater distance between the pairs of steel rods. All material in the counterforts supports load the same as the buttress itself, but the counterforts, at the same time, are most effective in stiffening the large flat slab (buttress), so that fewer struts are required.

Toward the top of the buttress (at elevation 15) two horizontal struts are tied to the vertical reinforcement (Figs. 4 and 5). These two struts are designed so that, besides their main purpose of holding the upper portion of the buttress in place, they are capable of supporting a light roadway. At elevation 45 another strut is placed near the up-stream face, mainly in order to support the triangular girder, should the latter ever be required to support any unbalanced arch pressure. All struts are able to withstand tension as well as compression, as can be judged from an inspection of the details on Figs. 4 and 5.

(To be concluded.)

Workmen's Clogs.—Mr. F. Hall Smith, engineer and surveyor to the Sheringham Urban District Council, would be glad to hear from any readers of THE SURVEYOR who have supplied clogs for the use of men engaged in tar painting, and to know where he can obtain supplies of such footgear.

London and Lancashire Fire Insurance Company.—The fifty-fifth annual meeting of the London and Lancashire Fire Insurance Company, Ltd., was held in Liverpool on April 25th, when the report and accounts for 1916 were submitted to the shareholders. The total premiums for the year amounted to £3,269,730, and the total underwriting profit, after providing for the increased unexpired liability, and after deducting income-tax, to £242,444. The reserve funds, apart from capital, now amount to £4,010,993, and the total security to policyholders has reached the sum of £6,652,243.

The Dust-Bins of Greater London.*

By REGINALD BROWN, M.INST.C.E., M.I.MECH.E., F.S.I., F.R.SAN.I.

In the Metropolis and the districts surrounding it the difficulties of storage and collection, and especially of disposal, of house refuse are more acute than in most provincial districts. Greater London has been chosen by the author because of these difficulties, and because of its continual growth. Continuation of growth means multiplication of difficulties and addition of responsibilities.

THE COST OF THE SERVICE.

The cost of the service, of course, varies considerably in the different districts, but in the London County Council Statistics, vol. I., it is calculated that the nett expenditure per head of population (after deducting income) amounts to 20·4d. in Inner London. In Outer London probably the cost is not so high, and if this is estimated at 1s. per head the total cost for Greater London works out at £519,919 per annum. In addition to this cost we may take it that some £1,000,000 are outstanding on the debt incurred for the service.

From a careful study of both "bulk" and "weight" the author has come to the conclusion that it is reasonable to assume the weight of 1 cub. yd. of refuse at 7½ cwt., and further that a fair estimate per head of population per annum would be at 4 cwt. and 14½ cub. ft. respectively. These figures are, of course, "averaged," but on these assumptions the total refuse to be disposed of in Greater London amounts to nearly 1,500,000 tons and over 3,750,000 cub. yds. per annum.

METHODS OF STORAGE.

The report of the Local Government Board on Scavenging (issued in 1914) states that in Inner London there are no wet ashpits, but a few districts still retain some dry ashpits—the actual number is, however, not known, but it may be taken at somewhere about 7,000—seven thousand abominations which ought to be done away with. In Outer London, as might be expected, a greater difference occurs in the nature of storage provided, although in the majority of instances the "bin" type has been adopted. Practically 50 per cent of the districts have over 95 per cent of covered galvanised iron bins, while in the remainder a large proportion of the receptacles are of this class. There are, however, still a number of dry ashpits. Other types of receptacles in use are wooden boxes, tubs, pails, baths and baskets.

METHODS OF COLLECTION.

In some districts by-laws are in force requiring the occupiers of premises to assist in the removal of the refuse. It is a doubtful policy—with the present system of storage—except for a "daily" collection, to insist upon occupiers placing the receptacles on the kerb or even in the front of the premises, as in the former case some unforeseen circumstances may arise to prevent the dustman calling on the appointed day, and in either case heavy dustbins are not very desirable things to carry about—especially where womenfolk are the only occupiers. Some authorities remove each receptacle separately, whilst others use a "dust-carrying tin" to avoid long distance of travel. The time occupied in both cases—especially the former—is a serious item of expenditure. In the majority of districts the collection is "weekly," but in the cities of London and Westminster a "daily" collection is in vogue, whilst in other districts—even where a weekly collection is in force—more frequent attention is given to busy thoroughfares large flats, mansions, hotels and public institutions. Westminster has had the "daily" collection in force for some considerable time, and the experience in that district is that it is as economical as a weekly collection. The author is, however, not in possession of the actual cost, but in one other place where a daily collection is carried out the cost is 1s. 3·7d. per head per annum.

At Hackney the cost of removal (1916) works out at 10d. per head of population, at Leyton 6d. per head, at Finchley 1s. per head, at Carshalton 7¾d. per head—these are a few of the places, carrying out work by contract, for which costs have been ascertained. Where the work is carried out by direct labour the costs are as follows: St. Pancras (1916) was 5s. 3¾d. per ton, at Hammersmith (1916) 3s. 8d. per ton, at Fulham (1915) 4s. 5d. per ton or 10d. per head, at Hampstead 5s. 11d. per ton, at Richmond 1s. 3d. per head, at Sutton 11d. per head, Twickenham 10d. per head, Wood-green 8d. per head, at Acton 4s. 7d. per ton, at Walthamstow 3s. 7d. per ton, 5d. per head. As a comparison one or two places may be given where the work is done partly by contract and partly by direct labour: At Penge (1915) the cost was 1s. 4·9d. per head, 2s. 4·9d. per cubic yard (in 1903-4 the amount was only 1s. 9d. per cubic yard); at Southall-Norwood (1915) the cost per head was 5·84d., per cubic yard 1s. 7·76d.; at East Ham, 7d. per head; at Southgate, 1s. 1d. per head. It is impossible from these figures to make any comparison of the various methods, because of the varying conditions inherent to each district, as the cost of collection depends upon many things, such as—frequency of removal, position of storage receptacles, number of men employed and their rate of pay, capacity of vehicles, motive power employed, cost of horse keep, horse hire, or fuel, distance of shoot from collection area.

The vehicles used in collection of refuse are usually provided with covers to prevent the material being spilled in the course of removal and haulage to shoot, the size varies from a two-yard cart to a 4-4½ yard van when horses are employed, but with mechanical traction the load may be increased to six cubic yards. The covers take the form of tarpaulins, wood door covers, quadrantal sheet-iron covers sliding in grooves or longitudinally. Some prefer one type and some another. In the most common form "wind guards" are provided to prevent the refuse being blown about whilst being discharged into the vehicle. The provision of this type of vehicle militates against a full load being obtained and consequently the cost per ton for removal is increased.

METHODS OF DISPOSAL.

The author, from a consideration of answers received to inquiries, has come to the conclusion that (expressed by weight) in Inner London only 35 per cent of the refuse is disposed of by destructor, whilst 62 per cent is removed out of the districts by barge or rail, the remaining 3 per cent being carted to tips; while in Outer London the quantities are 53 per cent by destructors, 0·7 per cent by barge and rail, and 46·93 per cent by tip; in other words, taking Greater London as a whole, 42 per cent is disposed of by destructors and 58 per cent. by tip, most of the latter being in districts of local authorities other than those in which the refuse is produced. The costs of disposal will, of course, vary for many reasons. The Local Government Board report on scavenging states that at Croydon, where 75 per cent is disposed of by destructor and 25 per cent. tipped the cost is 1d. per head per annum; at East Ham where similar methods are adopted and in like proportion the cost is 3d. per head; at West Ham where 42 per cent. is barged and 58 per cent. tipped the cost of collection and disposal is 11d. per head, and the cost of collection and disposal of that portion taken to tip is 5s. 9d. per ton; at Hampstead (1915) nearly 8,000 tons were disposed of by destructor, while over 17,000 tons were railed away. The cost of disposal for the two methods combined was 3s. 6·06 per ton, or 1s. 3·45d. per head. Where "tipping" only is in vogue the expectation is that the costs of disposal will be low—thus at Erith it is 7d. per head, at Finchley 4d. per head and Sutton 1d. per head, at Barking 2s. yard, Hampton Wick 12·8d. yard, Sunbury 11½d. yard, Uxbridge 2s. yard, Willesden 1s. 6·6 yard, Ruislip-Northwood 2s. 1d. yard, Finchley 1s. 9d. ton. To avoid capital expenditure as long as possible local authorities sometimes avail themselves of the use of the railway, canals or rivers. At Richmond, where all the refuse is put on rail, the cost of disposal works out at 8d. per head, or 1s. 5·18d. per yard; at Chiswick when any is barged away the cost (1914) is 3s. a ton; at St. Pancras (1916) barging cost 3s. 11d. per ton, whilst in April, 1916, the cost had increased to 4s. 7d. per ton; in Penge, where the whole of the refuse is put on rail by the council, the contractor paying carriage and disposing of the material, the cost in 1914-1915 amounted to 1s. 3·2d. per head.

* From a paper read at a Metropolitan District Meeting of the Institution of Municipal and County Engineers held on Friday last.

or 4s. 9d. per ton against 3s. 8·77d. per ton in 1903-4; at Hammersmith (1912) barging works out at 4·28d. per load or 1s. 2·48d. per ton; in 1916 the cost increased to 3s. 4d. per ton. In 1913 the cost per cubic yard at various places were as follows. Finsbury, 9½d. to 1s. 1d. by barge. Westminster, 3s. 3d.; Stepney, 1s. 6d. per ton by rail and 11d. per ton by barge.

So far as the cost of destruction by fire is concerned one is able to give the results at several places. Thus at Leyton where the whole of the refuse is dealt with by destructor the cost per head is given as 7d., at Tottenham 8d., at Barnes (collection and disposal) 1s. 11d., at Twickenham 6d., at Wood-green 4d., at Southgate 5d. These figures were obtained from the Local Government Board scavenging report previously referred to and obviously cannot all be based on the same principle of arriving at cost. In 1913 the author obtained further particulars as follows: Brentford, 2s. 7·816d. per ton; Croydon, 1s. 4½d. per ton net; Greenwich, 2s. 9d. and 3s. 1½d. per ton; Hoston and Isleworth (1916), 2s. 11·2d. gross, 1s. 0·2d. (net including loan charges); Stepney, 2s. 6·51d. per ton; Acton, 5s. 5d. (including loans); Tottenham (netto, 1s. 9d., Walthamstow (gross), 1s. 10d. per ton (no loan charges); Chiswick, 3s. 6d.; Hornsey (1916), 1s. 10d. per ton (no loan charges); Finsbury, 10¾d. per yard (without loans); Twickenham, 8¼d. yard; Acton, 5·2d. per yard (excluding capital charges); St. Pancras (1915), 3s. 9·7d. per ton; Fulham (1915), 4s. 3d. per ton; Hackney, 3s. 6d. per ton net.

It is a pity that municipal engineers have not agreed upon a proper form in which to keep the necessary cost records—if this had been done such discrepances as shown above would never occur.

One other method of disposal must be mentioned by the author before closing this part of his paper. Southwark has installed "crushers" or "manipulators" for the reduction of the refuse into a powder which is disposed of by rail to farmers. The author gathers that the cost of crushing is about covered by the price received for the material, so that when freightage is paid the nett cost to the authority appears to be about 2s. per ton plus establishment and loan charges. These figures are, however, probably subject to correction.

PROVISION OF RECEPTACLES BY THE AUTHORITIES.

Taking Greater London as a whole most of the local authorities throw the onus on owners of property to provide means for the storage of refuse between the visits of the dustmen. There is no stipulation even in Inner London with a daily collection as to the shape of the receptacle, but only as to the capacity, and there is no by-law or regulation to ensure any particular shape or to enforce the provision of movable receptacles to all houses.

It ought to be the duty of local authorities to provide these bins at the cost of the general ratepayer. In the Local Government Report on Scavenging previously referred to there is mention of the fact that some local authorities have obtained special statutory power to supply dustbins, but one cannot see that such powers are required, as the Board clearly points out that under the Public Health Act, 1875, an urban council can provide and maintain them as part of their scavenging apparatus. It is now many years since the council of the author's district adopted the principle of providing all the houses in the district with galvanised iron bins. So far as is known they were the first authority to do this, although even to-day very few cases can be found in which the example has been followed. The probable objection which may be raised against the principle is the ever-present one of £ s. d., but, fortunately, experience has shown that such a view is not well founded, as the cost spread over a large number of years is not more (with bins at 4s. 6d. each) than about 4d. per ton per house, the average life of the receptacle being 10-14 years or more, with care they have been known to last for over 20 years. The principle of supplying bins to houses is not such a difficult one to attain, as the authority issues an instruction that all new houses erected in their district will be supplied with bins at the cost of the general ratepayer and that existing houses will be treated in a similar manner as owners who provide the first bins as and when the bins become worn out.

IS THE PRESENT BIN THE BEST MEANS OF STORAGE?

Bound up with the question of storage is the facility in loading the vehicles used for removal. Speed in loading is an essential feature in economical removal, the shorter the time taken to load the smaller the cost per ton for removal and *vice-versa*. If a vehicle has to stand waiting for the dustbins to be fetched from the backs of the houses and each bin is sparately emptied directly into the vehicle the delay is a serious one. Again, to prevent disturbance of the refuse in proximity to the premises it has been suggested that special vans be provided in which the full bins should be placed and replaced by clean empty bins. It takes very little argument to show that such a method is limited by the expense involved, and no authority is likely to adopt such an idea. The ideal method would probably be the provision of a non-returnable receptacle to each house, in which the refuse could be stored in a sanitary manner, light and easily removable and supplied at a cheap rate, so that it may be burned or disposed of with its contained refuse. If such a receptacle could be obtained it would remove some of the objections to the present methods. We should have no dirty receptacles; the receptacle would be much easier to remove, and we should have no disturbance of the refuse in the vicinity of houses; in fact, the receptacles could be carried out by the collectors to the front of the premises whilst the carmen had proceeded to shoot, and on their return the loading time would be greatly reduced. As it is unlikely that such a sanitary receptacle can be obtained at a sufficiently low price as to be "non-returnable," we have to turn our attention to other means.

Is it possible to obtain such other means at a reasonable figure? The author thinks it is, and he puts forward the following plan, tried by him on a small scale, and found to be successful. As the present shape of bin is of excellent design the author retains it, but uses a skeleton frame only, and provides as a lining a cheap canvas bag dressed with rof-proof and waterproof composition, and hung on to the top ring of the bin by means of strong metal hooks (four are a convenient number). The modus operandi is as follows:—

At each visit the full canvas bag is lifted bodily out of the bin and "whipped" round the top by means of an attached cord, and a clean bag is put in its place. The dustman has thus a fairly light and closed receptacle which can be easily handled and carried to the front of the premises, and when the collecting vehicle arrives can easily be thrown into the vehicle whilst the latter is constanly moving, and so ensure quick loading. Other features of the suggestion are there is no disturbance of refuse, and as there is no chance of spilling the contents—they being enclosed in "closed" bags—there is no necessity to have covered carts, and consequently much bigger loads can be carried than on the present vehicles. The only disturbance of the refuse is at the disposal works, where the vehicles can be emptied in the ordinary manner and the bags freed from their contents. Such a method does not in any way interfere with, but rather facilitates, the sorting and storage of the material before it is finally dealt with. The bags can be used on several occasions and can be efficiently cleansed when necessary by passing them through a steaming and disinfecting chamber. The suggestion does away with the present cause of dirty dustbins, to which also it ensures longer life, and the speed in loading, and bigger loads, tends to economy, whilst the non-disturbance of refuse in the vicinity of houses will favour it from a sanitary point of view.

COLLECTION.

As the cost of vehicles and motive power—whether horses or otherwise—is much higher than manual labour, it follows that for economy, quick loading, speed in taking the refuse to the shoot, and quick discharge and quick return journey must be aimed at. The comparative cost of haulage by horses and motors is very difficult to obtain in every day working, because of the different conditions obtaining in the several districts. Either the distance to which the refuse has to be carted varies, or the times taken to load the vehicles do not agree, or it may be the capacity of the latter is not the same. From a consideration of the subject under exactly similar conditions, one is led to believe that under a three-mile radius the horsed van is the most economical, beyond this distance the steam wagon or other similar low-working cost vehicle; but for all-round economy the steam tractor, combined with four yard collecting vans and horses appear to lead the way. This latter is similar to the method used at Acton. So far as mechanical traction is concerned, there are very few places as yet where one can find this method in use for the removal of house refuse. The Westminster

City Council use motors, but the author is not in possession of full details as to cost; but here it is as well to remember that a daily collection is in vogue, and the occupiers render assistance, and the dusting is finished before 10 a.m., so that the motors work under the best conditions. At Chelsea Mr. Higgins finds that on an experience of nine months' working the average costs works out by steam wagons at 4s. 5d. per ton, against 4s. 9½d. per ton for horses. At Hammersmith a steam wagon was found to cost more than that of horses. In the City of London mechanical traction has not been found economical for removal of house refuse. Mr. Finch, of Kensington, gives a comparative cost of 4s. 4½d. per ton by motor, compared with 4s. 7·88d. per ton by horses. From these figures the cost by motor—under the ordinary methods of removal—appears to be equal to or even greater than horse haulage, except when the standing charges can be reduced by using the motors for other work besides dust collection. There appears, however, to the author no reason to believe that if the motors can be kept constantly travelling, as in Acton, but that economy would result, whilst if the horsed vans can be done away with and the motors kept constantly travelling, as would be the case with the dust receptacle suggested by the author, there would be greater economy, especially when it is borne in mind that the "fillers" are continually engaged on useful work during the absence of the motor from the collecting area.

POSITION OF DISPOSAL WORKS.

Another point to which the author wishes to draw attention is the position of the disposal works. The positions are usually chosen with regard only to the requirements of each district, and it is difficult sometimes to realise what has been the ruling factor in the choice of site. One could go on indefinitely into the question of the positions of sites and their sole utilisation by separate districts instead of being joint undertakings, and it is worth considering whether sites for disposal works should not be selected with this object in view, whether the disposal is to be by destructor, barge, or rail, or other means. It is, however, one thing to suggest and another to carry out, and so long as each separate authority is only bound to consider the requirements of their own district, and we are governed by boundaries instead of communities, the present condition of things must exist; but if the cleansing of London (Greater London) was under one authority, that authority would see to it that, at least, the position of the disposal works should be the most economical as well as the method of haulage. Fortunately, one need not wait for the creation of such another authority; the various councils could combine, and so gain monetary advantage to each. It has been done largely in the matter of water supply, and in collection and disposal of liquid wastes, especially in Inner London, and there seems to be no reason why such a principle should not be carried out in the matter of collection and disposal of solid wastes, which could carry with it the utilisation of by-products. It is patent that the smaller the radius controlled by each works the cheaper will be the item of haulage, but it would not do to have too many works dotted about all over Greater London. The author suggests that a radius of about a mile would be a convenient unit, and on this basis some 29 would be required in Inner London and 144 in Outer London.

DISPOSAL.

The author has already dealt with the methods of disposal in use at present, and the costs of such disposal, but he ventures to suggest that the time has arrived when stock should be taken of the position, so as to ascertain whether the best means are being adopted, whether even with the present means the best value is being obtained, and, if not, what can be done to remedy matters. "Economical utilisation with sanitary efficiency" should be the watchword. So far as sanitary efficiency is concerned, there can be no question that destruction by fire is all that can be desired; but when it comes to economical utilisation, the dust destructor is by no means the last word.

Mr. Harrison, of Southwark, has shown that house refuse, when reduced to a powder, will find a ready sale as a manure, but the author puts forward the suggestion that the actual manurial value is nowhere near equal to the actual calorific value, and therefore the latter is the more important, but there is no reason why both the calorific value and the manurial value cannot be utilised—as they ought to be.

CALORIFIC VALUE OF HOUSE REFUSE.

In the author's opinion there is calorific value in house refuse, and he has been endeavouring for some considerable time to devise a means of turning it to proper account. That he has been successful in doing so has led him to take out full patent rights in a process for the manufacture of a composite fuel from house refuse. He is, however, under advice, precluded from giving full details and claims at this stage, as the publication might affect application for foreign rights. Briefly, however, his process consists in crushing, briquetting and impregnation. The refuse on arrival at the works is immediately crushed into powder, it is then briquetted, the moisture eliminated, and afterwards impregnated either by dipping or under pressure. By these means the refuse is dealt with without accumulations. It is immediately subjected to treatment which is not only cleanly in operation, but is absolutely sanitary. No nuisance can arise either in the course of manufacture or during "after storage." The material can be reinforced to any degree necessary with other material of high calorific value. The manufactured fuel can be stored and used as, where, and when required—in fact, we get a material in which not only the original calorific value is retained, but is added to by reinforcement.

It is, of course, unnecessary to have destructors, the fuel being usable in ordinary furnaces, and the mere fact that it has not to be got rid of directly it reaches the disposal works will ensure its full value being recovered. According to analytical tests of average house refuse there would be about 3,700 B.T.U.'s per lb. after elimination of moisture and before reinforcement, and as this latter can be carried to any necessary degree it is possible to obtain a fuel of standard value. The principal point, however, in the author's mind at present is the conservation of, at least, the original calorific value and the recovery of the cost of disposal. Including cost of buildings and plant the fuel can be manufactured for 7s. 6d. per ton (more or less according to the extent of reinforcement desired), and the author has every reason for believing that the fuel will easily fetch 10s. per ton (more or less, according to the degree to which the reinforcement is carried). On these cost figures a local authority could—if permitted—sell the fuel at 3s. 9d. per ton and then not exceed that of destruction by fire, while all receipts above this figure react in favour of the author's process. Again, by any method at present in use there is no possibility of recovering even the total costs of disposal, whilst by the author's process not only is house refuse disposed of in a sanitary manner, but the disposal carries with it "economy," because the product can be "utilised" to the full, and the total costs of disposal more than recovered, besides assisting in the conservation of the coal mines.

The author hopes that the submission of this paper will give rise to a friendly criticism of the suggestions made, and if these hopes are attained he will be more than satisfied, as it will add to the pleasure he has felt in writing these notes.

Canals Control.—In reply to a question in the House of Commons whether the canals in England taken over by the Government are under the control of the Canal Committee or the Railway Executive Committee, Mr. Roberts, Parliamentary Secretary to the Board of Trade, said the Canal Committee control the independent canals which have been taken over by the Government in England, and the Railway Executive Committee those which belong to railway companies.

Association of Managers of Sewage Disposal Works.—A meeting of the Metropolitan District of this body will be held at the Sewage Disposal Works, Wanstead, Essex, on Saturday, the 12th inst., at three p.m. The chairman and members of the Wanstead Urban District Council will meet the members of the association at the works, and Mr. Edward Lindon (member) will give a description of the works. The objects of interest are: Detritis tanks, primary and secondary sedimentation tanks, storm-water tanks, sludge lagoons, rectangular filters, and contact beds. The machinery comprises electrically-driven grit elevators and screens, stereophagus pumps, Hartley's power-driven distributors, electric motors, &c. Trains to Manor Park Station (G.E.R.) or East Ham Station (District Railway), thence by 'bus or tram to Wanstead Park-avenue. Entrance to works, Empress-avenue.

Institution of Municipal and County Engineers.

METROPOLITAN DISTRICT MEETING AT WESTMINSTER.

At a Metropolitan District Meeting of the Institution of Municipal and County Engineers, held on Friday evening last at the institution offices, the question of the

STORAGE, COLLECTION AND DISPOSAL OF HOUSE REFUSE IN GREATER LONDON

was discussed on an exhaustive paper submitted by Mr. Reginald Brown, engineer and surveyor to the South-Nyssa Urban District Council. The presentation of the paper, which is reproduced in part elsewhere in this issue, was followed by a discussion in which many aspects of the problem were dealt with. Mr. G. W. Humphreys, chief engineer to the London County Council, the district chairman, presided, and those present included Messrs. H. E. Anderson (Lambeth), R. J. Angel (Bermondsey), R. H. Bicknell (Westminster), J. Birch (East Ham), H. Percy Boulnois (Westminster), J. S. Brodie (Blackpool), Reginald Brown (Southall-Norwood), P. Dodd (Wandsworth), T. W. A. Hayward (Battersea), F. W. Jones (Deptford), P. J. Killick (Finsbury), Frank Massie (Wakefield), J. P. Norrington (London), J. C. Radford (Putney), Norman Scorgie (Hackney), hon. district secretary), E. J. Silcock (Westminster and Leeds), C. Chambers Smith (London), E. F. Spurrell (Holborn), J. Sutcliffe (Woolwich), J. P. Wakeford (Wakefield), J. A. Webb (Hendon Rural), F. Wilkinson (Deptford), E. Willis (Chiswick), and O. E. Winter (Hampstead).

Mr. J. S. Brodie (Blackpool), in proposing a vote of thanks to the author of the paper, said he agreed that the existing methods of disposal of towns' refuse were wasteful. Some years ago he read before the Royal Sanitary Institute a paper in which he described the methods in vogue in Blackpool, and just as in Chicago, in dealing with pigs everything was utilised except the squel, in his town everything was utilised except the smoke from the destructor. Their expenses worked out at very considerably less than those which Mr. Brown had given, but there might, of course, be local reasons to account for that—it was necessary to know the local facts. As far as possible they separated before destruction anything of manurial or calorific value that could be used economically. For instance, all the oyster shells were taken out and ground up and sold to feed chickens; the tins were sorted out, pressed into solid cakes in a specially constructed machine, and despatched to Sheffield and other places; and the clinker was sold at the best possible price. They had not an ashpit in the whole of the borough; they had bins of 2 cub. ft. capacity, which were always provided at the expense of the landlords. They would never think of allowing women to carry the bins out to the yards; their own men did this part of the work. Mr. Brown had thrown out some observations about dustmen being employed in other work, but he could not imagine anything like that being done at Blackpool.

Mr. T. W. A. Hayward (Battersea), seconding the vote of thanks, said he disagreed with Mr. Brown that it should be the duty of the local authority to provide bins. If it were done it would cost more than double what it did at the present time, because his experience was that things that were provided for the asking were not valued so much as those provided by the people themselves. It was a very small matter to insist upon every house being provided with a proper bin, and he hoped that some day it would become compulsory and a standard bin adopted. He had learned that it was the practice in some districts for the dustmen who, by the way, were employed by a contractor to take a big basket into the premises and tip into it the contents of the bins. That was probably done without the knowledge of the engineer of the district who ought to be informed of what was going on. The canvas bag idea seemed to be a good one, but impracticable. In wet weather, and especially in continuously wet weather, it was not possible to collect the dust as stated in dry weather, and he was afraid the handling of these bags under such circumstances would be a rather difficult matter, and not altogether a pleasant one. He had found no difficulty where movable dustbins were provided. Instead of having a set gang for one vehicle, he arranged the vehicles to follow each other, and the carmen only went to the depot. He thought it would be admitted that they could have nothing better than a refuse destructor; but it was a costly method of disposal nowadays. The difficulty was to get rid of the residue from the destructor. In London, of course, the districts near the river had facilities for disposing of refuse which others did not possess—he referred to barging. That was not altogether a wasteful method, because the refuse was used for filling up holes that had been excavated, and bringback disused land into cultivation. In doing that they were rendering a service to the country, if the method was not altogether a sanitary one. It was difficult in London to deal with refuse, because of the enormous cost of labour—for sorting they had to pay a man from 9d. to 1s. an hour. Another thing was that the men could not be got to work quite as expeditiously as was done in the provinces, and he did not therefore think the sorting problem could be satisfactorily solved in London. It would be interesting to hear more of Mr. Brown's new process. He had heard of similar processes being adopted in the past, but without much success at present; but if the process was a practicable one, and one likely in practice to reach the ideal Mr. Brown had set forth, then he thought they would all welcome it.

Mr. H. Percy Boulnois (Westminster) said he had been a "destructor man," but the last two years had entirely changed his ideas, and he was quite in agreement with Mr. Brown as to the necessity for utilising instead of destroying refuse. The author had included in his paper the costs of collection in the various districts, and in that connection he had very properly drawn attention to the want of standardisation of returns. It was well known that their institution were preparing such forms, and he hoped that these, when issued, would be scrupulously followed. On the question of bins, some years ago a German-Swiss village introduced what was known as the Ochner system, in which the receptacles, which were taken into the houses, were so constructed that they were easily filled and afterwards closed down and put on to a wagon without the refuse ever seeing daylight. The bag system referred to by Mr. Brown had been tried, but the medical officers of the country decried it, because of the corners, which prevented the sacks being cleaned properly. The bags harboured maggots, and resulted in the breeding of flies. They had not been told anything as to the capacity of the bags, and he should have been glad if Mr. Brown could have shown them a sample of them. He agreed in principles that the bin at present was not altogether a success, and if, as had been suggested, they could have a receptacle which could be burnt with the rest of the refuse, it would be an advantage. As regarded the question of haulage, his own view was that the old horse-vans were to be preferred to mechanically-propelled vehicles, owing to the constant stoppages that were necessary in the process of collection; at the same time it might be possible to arrange a system by which, having collected the refuse at an intermediate depot, it could be conveyed by self-propelled vehicles to the point of ultimate disposal. As to the question of briquettes, Mr. Brown put forward the suggestion that the actual manurial value was nowhere equal to the actual calorific value. He (the speaker) did not know what was the calorific value, but he knew that the calorific value of briquettes made of coal dust was very little, and that, so far, any sort of pressed briquette was really not an economical article. But if Mr. Brown could make out of this waste material a briquette that could be utilised at sewage works in the drying of sludge, he would be using one waste product to render another waste product of value.

Mr. P. Dodd (Wandsworth), referring to the cost of the service quoted from the London County Council statistics, Vol. I, pointed out that these related to the year 1890-91—about twenty-seven years ago. The approximate figure of 2/4d. per head in inner London would now have to be materially increased, and this, of course, only emphasised still more the magnitude of the subject under consideration. Dealing with the amount of refuse likely to accumulate, not only the quantity but the quality and calorific value of the

refuse varied considerably in his own district, which was served by six dusting contractors. As to methods of storage, these depended upon the methods of collection, whether weekly, bi-weekly, or daily. It seemed to him that the best solution of this problem, both in the interests of public health and economy, was a daily collection. About thirteen years ago they adopted as an experiment a system of daily removal of house refuse in a certain defined area in his district, containing both poor and better class houses, in substitution for the weekly removal. The occupiers were requested by printed notice, given in accordance with the bye-laws made by the London County Council, to deposit the dustbins on the kerbstone or edge of the footpath immediately in front of their respective houses. They commenced the collection at 7.30 and finished at 9.30 a.m. One of the occupiers, whose house was 40 ft. away from the road, refused to comply with the notice (although he was willing to place the dustbin in a conveniently accessible position on the premises), and entered an action against the council under Section 30 of the Public Health (London) Act, 1891, for failing to remove house refuse from his premises. The case was first heard before one of the metropolitan police magistrates, and eventually it went to the High Court. The decision was given against the council, it being held *inter alia* that the council should have prescribed a conveniently accessible position on the premises and not on the kerbstone. The question of the daily collection was dropped, but the result of the experience was that the daily collection cost about 10 per cent. less than the weekly collection. Under a system of daily collection the majority of the dustbins did not require to be more than one-third of their present size, and if suitable strong canvas bins (on skeleton frames and "whipped" round the top by means of an attached cord) could be provided as suggested by Mr. Brown, and occupiers of houses placed them in conveniently accessible positions near the roadway, it would facilitate rapid collection and create a better sanitary condition of the premises. Moreover, with such light dustbins a great deal of the work of collection could be done by women. With regard to the figures relating to the cost of collection and disposal in various districts, he thought it required a Philadelphia lawyer to make satisfactory comparisons with these figures, and it only showed the necessity of a standard form being adopted for tabulating information of this kind. As mentioned by Mr. Boulnois, a committee had been appointed by the council of the Institution for dealing with this matter, and already forms relating to house refuse and tar-spraying had been approved and adopted. He had tried to make some comparisons from these figures of the total cost of collection and disposal in the various districts mentioned, and had succeeded to a certain extent. He naturally wished to find out how his own district stood with regard to these figures. The following was the result:

Name of District.	Cost of Collection and Disposal Per head. s. d.	Per ton. s. d.
Leyton	1 1 ...	—
Finchley	1 4 ...	—
St. Pancras	— ...	9 10¾
Hammersmith	— ...	4 10·48
Fulham	— ...	8 8
Hampstead	— ...	9 5·66
Richmond	1 11 ...	—
Sutton	1 0 ...	—
Twickenham...	1 4 ...	—
Wood Green...	1 0 ...	—
Acton...	— ...	10 0
Walthamstow	— ...	7 6
Penge...	2 7·11 ...	—
East Ham	0 10 ...	—
Southgate	1 6 ...	—
West Ham	0 11 ...	5 9
Barnes	1 11 ...	—
Wandsworth (1913-14) ...	0 11·7 ...	4 3·02
,, (1917-18) ...	1 7·24 ...	7 2·48
Southall and Norwood ...	Cost of collection only is given.	
Hackney	Cost of collection is given per head and cost of disposal per ton.	

It would be interesting to know the total cost of disposal by crushers, including establishment and loan charges. With reference to the provision of receptacles at the expense of the authorities this would be rather a tall order, because taking the cost of the bins at 4s. 6d. each, as mentioned by Mr. Brown, it would amount in his district to £15,750 or nearly a 2d. rate. With regard to the question of the method of disposal of house refuse, whether by destructor, barge, rail or tip, they had adopted all these measures in his district up to the present time with satisfactory results, but by reason of the difficulty in getting rid of the clinker since the war, the destructor method was the most costly just now. As to the calorific value of house refuse, he found, and no doubt other engineers and surveyors had the same experience, that owing to householders now being more careful they had less cinders and paper with the refuse, the result of this being that they had to use coal and old wood blocks to assist in burning it. As to tins and old iron collected from the dustbins it was proposed to carry out some experiments at Wandsworth shortly for dealing with these, and, if successful, demonstrations would be held, to one of which members of the Metropolitan district of the institution would be invited. Of course there were other materials from the dustbins, such as bottles, newspapers, old clothes, fats, bones, old toys, and broken glass, &c., which also formed valuable assets. A few years ago he made inquiries, and found that these, which were described by the dustmen as "tots," realised about 15s. per week per man. In addition, each man received on an average by way of gratuities—"sparrows"—5s. per week. It seemed to him that Mr. Brown had made a good commercial proposition, and he should receive every support and encouragement in its development.

Mr. E. WILLIS (Chiswick) said he thought the question of utilisation was one that would have to be considered very seriously, and he was rather inclined to think that one of the best ways of dealing with the house refuse problem was somewhat on the lines of the method adopted in France some years ago—subject to certain improvements. The suggestion he threw out was that house refuse should be delivered without handling on to rocking inclined screens. As the material went on to the screens it would be sprayed with a disinfectant—possibly oil tar was one of the cheapest media. The finest ash resulting from the screening process had practically no calorific value, and would as far as possible be deposited on tips or sent on to clay land and the residue would be dealt with in retorts; for by eliminating the fine ash one could get some result in gases, which could be used for various heating purposes. He hoped that Mr. Brown's process would be a success. He (Mr. Willis) had made a trial of coal briquettes during the war both for municipal purposes and in his own house, and he had been astonished at the intense heat they retained. But they had one disadvantage. They created an enormous amount of very fine dust. In every case in which he had made up a fire with the briquettes at night it was red in the morning, but directly it was touched it went to pieces, and that was a disadvantage Mr. Brown might find. He did not quite agree as to carts not being loaded up to their fullest capacity. The size of carts must be regulated by the character of a district. When he went to Chiswick he found small carts in use. He doubled the size and decreased the cost enormously. He had tried the canvas bags which had been referred to, but he had found a difficulty in getting people to use them. The bags he used were round in shape, and had one small hole in the base to drain off the moisture from the refuse, but they had not proved a success.

Mr. O. E. WINTER (Hampstead) said that in his district there had been a bi-weekly collection of refuse up to the outbreak of war, and it had proved generally satisfactory. Hampstead was one of the first places in London to adopt a destructor, but the installation was unfortunately placed about three miles outside the boundary of the borough, and haulage had consequently been a very serious factor. For the past seven or eight years they had taken only about one-third of the refuse to the destructor; the rest was put on rail and sent into the country to tips. He had always regarded the Southwark practice as one of the most satisfactory methods at the present time, both on the score of efficiency and economy.

Mr. R. J. ANGELL (Bermondsey) said he was not convinced that the briquette system would be the success hoped for by Mr. Brown. The very fact that it succeeded at the beginning would mean its failure afterwards, because if it was going to give all this heat everyone was going to use it, and the residue from the material could not be used to make new briquettes. He agreed as to the amount of dust that would come

from it. In Bermondsey they supplied householders with one, two or three bins, according to requirements. He considered that should be the general practice, because as one went through London and saw the hetereogenous collections of all sorts of receptacles that were made use of, it struck one that it was not worthy of the greatest city in the world. But most bins were round, and he did not think that was the proper shape. He had gone into the question and his idea was that the bins ought to be square. He had had made a square bin of a capacity similar to that of a round bin, and had found that it would go into a smaller space, while being square it fitted better into corners. An idea he had suggested was that there should be a double set of bins for each house, with only one lid for the two. In the process of collecting an empty bin would be left, and the lid from the full one placed on it before the full bin was taken. In Belgium he had seen a form of three-decker trolley in which bins were deposited for transport to the tips, where, after being emptied, they were cleansed and brought back, and it had appealed to him as a quick and cleanly method of disposal. It was certainly better than emptying refuse into a van in a street, specially on windy days. Personally, he thought householders did value these bins, and looked after them. The only people who did not were the dustmen, who had a habit of banging them on the edge of the cart in order to get out the last bit of refuse. He could not agree that bags were the best receptacles. As to the question of a daily collection, personally he thought either twice or three times a week was quite sufficient. He should have liked to have heard something from a representative of Bethnal-green, where they had a method of separating the refuse on a moving screen, the material being afterwards dealt with in various ways. He thought it would be well worth knowing something about. In Bermondsey they had laid down a four-cell plant similar to that of Southwark. Their greatest difficulty had been to get rid of the crushed refuse, and it was only just recently that one of the large firms of patent manure merchants had made an agreement with the council to take the material. The manurial value of house refuse was only 2 per cent., and if makers of patent manure could be induced to take it up and use it as a carrier for their own materials, it would be a better way of utilising it than if it were used in a neat form.

Mr. F. Wilkinson (Deptford) inquired what tonnage of blocks Mr. Brown could get from, say, 1,000 tons or 1,000 cubic yards of refuse. As regarded the use of this fuel for the drying of sludge, he would be interested to know what degree of moisture was left in the sludge after it had been dried, because it was well known that it was one of the hardest things in the world totally to eliminate moisture in sludge.

The vote of thanks was passed.

Mr. Brown, in returning thanks, answered briefly a number of the questions put in the course of the discussion. He has since prepared the following written reply: "Mr. Hayward does not agree with me that local authorities should provide dustbins for every house, because he thinks that they would not be used properly. My answer to this is that the damage to the present bins is not done wholly by the tenants, but principally by the local authorities' own staff in emptying operations. Granted that some tenants do damage the bins by putting unsuitable material in them, but the remedy is to make the bins public property, and punish offenders damaging them, which would soon put a stop to the practice. Personally, I have found that by far the greater majority of tenants do take care of the bins, as witnessed by the average life of those supplied in the author's district. I was delighted to have Mr. Boulnois' remarks, and whilst he does not, of course, agree with all my suggestions, he is strongly of opinion that 'Utilisation' ought to be the watchword. The wide experience of Mr. Boulnois adds value to his opinions on refuse destructors as an economical method of refuse disposal. I can quite sympathise with his point as to the use of canvas bags and the objections which may be raised to them, but I do not think that the objections would materialise in actual practice. I have had bags in use for the last six months, and they are as good now as at the beginning. My chief point here is that we want a better form than the present portable galvanised-iron dustbin to facilitate removal and cheapen the cost of the service. Mr. Boulnois' suggestion as to the use of horses and carts for collection, and intermediate depots from which mechanical haulage could remove the refuse, is another suggestion of cheapening, but with easier loading to keep self-propelled vehicles constantly on the move intermediate stations are unnecessary. I do not agree with Mr. Boulnois that coal briquettes are of little value; in fact, I have quite recently seen such a form being sold in quantities at £2 per ton. The calorific value of the refuse briquettes depends entirely upon the class of refuse, but on an average—without reinforcement—may be taken to be equal to one-fourth to one-fifth the value of house coal, but the degree of reinforcement would tremendously increase this value. Mr. Dodd, by his remarks, emphasises the magnitude of the problem, and agrees to a certain extent with the idea of the canvas-bag system. To his question as to the cost of disposal in Southall-Norwood, my answer is 4d. per yard, or 10d.-11d. per ton. But it is not disposal, it is tipped to waste—it is costing us this to throw it away. He questions the wisdom of the local authority providing the bins, and estimates that in Wandsworth the cost would be a 3d. rate. In Southall-Norwood it is nearly a 1d. rate, and we are quite satisfied to pay this for the many advantages accruing therefrom. Mr. Willis mentioned a method previously suggested for conversion of the refuse into fuel, but the reply is that my process is entirely different, otherwise it would not have received patent rights. Mr. Willis thinks that the use of the briquettes in domestic grates would be dusty. I do not suggest that the material should be used in the ordinary open register stove; in fact, I suggest it being used for a much more important purpose. Mr. Winter thinks that the quantity of refuse is much larger than it ought to be, and one agrees to this without qualification, but Londoners are much more economical than some towns in the North—the coal country. I know of cases where the quantity in London is exceeded five times. I appreciate Mr. Winter's agreement that three miles is the economical limit for electric traction, as this corresponds with my investigations, and has been proved in Sheffield. Mr. Angel is of opinion that if my method of converting refuse into fuel is a success, its very success will lead to its failure. Mr. Angel need not fear this if he could only compare the amount of refuse produced per annum with the amount of coal consumed per annum. Although he does not agree with the canvas bags, he does agree that the men are the culprits in damaging the present bins. Personally I am not married to a canvas bin, but I am to the principle; the germ of a more economical storage is in the suggestion, and it only wants cultivating to produce a better type."

In proposing a vote of thanks to the chairman for presiding, Mr. Hayward took the opportunity of congratulating Mr. Humphreys on his election—announced in The Surveyor of last week—as a member of the Council of the Institution of Civil Engineers. The thanks of the meeting, added Mr. Hayward, were also due to Mr. Scorgie, the hon. district secretary, for his share in the arrangement of the successful gathering which had taken place that evening.

Mr. Willis seconded the proposition, which was duly carried, and the proceedings then terminated.

ROYAL SANITARY INSTITUTE DISCUSSION.

We are informed by the secretary of the Royal Sanitary Institute that the time of next Tuesday's meeting of that body, at which Mr. C. H. Cooper, the borough engineer of Wimbledon, will open a discussion on the Collection and Disposal of House Refuse, has been altered from 6 p.m. to 5 p.m.

L.C.C. Tramways Deficiency.—Presenting the estimates for the year 1917-18 at the meeting of the London County Council on Tuesday, the chairman of the Finance Committee, Sir George Goldie, said the tramways estimates for the current year showed a probable deficiency in the nett revenue account of £89,402, and a draft would have to be made on the already depleted Renewals Fund, unless some means were devised for obviating the adverse balance. On the other hand, the amounts contributed out of rates in earlier years to meet deficiencies in regard to working-class dwellings had now been wholly repaid. The steadfast aim of the council had been to make these building schemes self-supporting, and this object would have been achieved when the accounts for last year had been made up.

Law Notes.

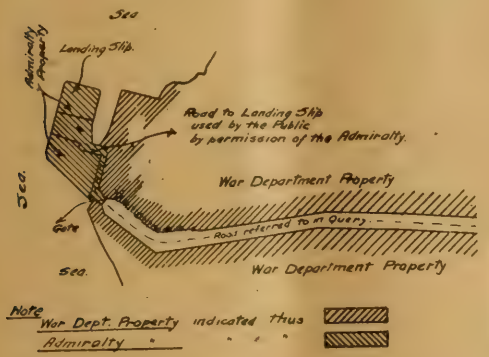
EDITED BY J. B. REIGNIER CONDER, Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. *The letter X, combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

PRIVATE STREET WORKS: CROWN PROPERTY.—"Royal" writes: A road with the whole of the frontage on each side Government property, partly War Department and partly Admiralty, is generally open to the public, but is closed one day in each year by the Admiralty, and has been so closed for more than twenty years past. In consequence of pressure by the War Department being put upon the local authority in whose district the road lies, the local authority have consented to re-coat the road and to bear about half of the expense. In the past the local authority has kept the road in repair generally. The Private



Streets Works Act, 1892, has not been adopted, and if it is held that this road comes under the definition of a "private street," the works would be done under the 150th section of the Public Health Act, 1875. The following information is desired: (1) Is the road a "private street"? (2) Is the Government or Crown excepted from being charged for works executed under the provision of the 150th section? (3) Having regard to the case of *Drysdew* v. *Putney (Overseers of)* (34 L.T. (N.S.) 69), can the council legally contribute anything towards the cost of repairing this road? (4) If not, and such a contribution is made, to what penalty would the council be liable, and by whom could proceedings be taken against them?

(1) This depends upon whether the road is "repairable by the inhabitants at large" or not. If dedicated before August 31, 1835, it would be, *primâ facie*, so repairable. If dedicated after that date it may have become so repairable either by enrolment of a magistrate's certificate, under sec. 23 of the Highway Act, 1835, or by adoption by, or agreement with, the local authority. See my "Notes on the Law of Private Street Works," pp. 4 and 5.) If not so repairable it is a "private street." (2) As a general rule, the Crown is not bound by an Act of Parliament, except so far as mentioned therein. The Crown is not mentioned in the Act of 1875, and therefore, in my opinion, the Crown is not chargeable in respect of private street works expenses under sec. 150 of that Act, and if the property is used solely for the purposes of the Crown the Government is not chargeable. See *Hornsey Urban District Council* v. *Hennell* (66 J.P., 13). (3) The decision referred to applies solely to expenses which are recoverable from frontagers. The council can, in my opinion, legally pay expenses *not* so recoverable. (4) In such an event the council might be ordered to restore the amount expended to the general rate, and to recover the same from the frontagers. See *Attorney-General* v. *Wandsworth District Board of Works* (1877, 6 Ch.D., 539). Proceedings could be taken by the ratepayers with the concurrence of the Attorney-General.

OPENING ROAD FOR LAYING DRAINS, &c.—"L. D." writes: (1) A contractor opened a road to reset a gully which had been previously demolished, and was told before opening up the ground to give notice to the surveyor. The contractor opened up the ground without notice, and cut a trench across the road (which was unnecessary), and stopped traffic. The chairman said to the surveyor: "Take it from me I will not have the road stopped for a flimsy piece of red tape of yours, and let me have particulars of the case in writing." The surveyor replied that he considered the statement of the chairman a threat, and would reply to any query the chairman wished to address to him, provided such statement was in writing. The chairman has not put his request in writing. In consideration of the subdued threat, &c., has the chairman any legal authority to demand a road temporarily stopped to be opened? What is his remedy; or is there any remedy against him? (2) A surveyor requested drains to be opened for inspection, and the clerk to the authority told the man who was laying the drains not to open them for the surveyor's inspection; at the same time the clerk did not make any communication to the surveyor? Does the clerk to the authority render himself liable to any penalty for so acting? (3) The town clerk and chairman interviewed the man, and gave him permission to open the road without any notice to the surveyor. The surveyor wrote and asked the man to open up the road so as to ascertain whether any damage was done to the council's pipes. This the man refused to do. The surveyor opened up the ground, and discovered that a surface water drain had been deliberately cut through. The surveyor asked the clerk and chairman upon what terms they gave permission for opening the road, but neither would give the information. Are either the chairman or the clerk responsible?

(1) In my opinion the chairman has no such legal authority, unless he has been specially authorised by the city council so to act. His remedy would be to move a resolution of the council instructing the surveyor to take steps for the reopening of the road for traffic. I do not think there is any remedy against him in respect of his remarks to the surveyor. (2) In my opinion he does not, but his statement to the man would not relieve the latter from the duty of complying with the regulations of the city council. (3) Unless specially authorised by the city council, neither the clerk nor the chairman would have power to waive the council's regulations, and their "permission" would be simply a nullity, and not binding on the council. But they do not appear to have incurred any legal liability.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRY HELD.

Dublin T.C. (April 27th. Mr. P. C. Cowan).—£26,434, for the erection of houses in the Spitalfields area. In the course of the proceedings the Lord Mayor stated that there was an urgent necessity for the erection of seveny-five houses in the area. The city treasurer (Mr. E. W. Eyre) said that if they wanted to house the class of people for whom houses ought to be provided they could not charge more than 5s. 6d. per week. They could put on a higher rent, but the people the corporation wanted to house could not pay it. If the houses were to pay their way the rent would have to be 13s. 6d. The loss on the corporation houses at present was £13,000 a year. It was contended on behalf of the opponents of the scheme that if the corporation built on this particular site it would in a short time become a slum like the surrounding district.

APPLICATIONS FOR LOANS.

Gloucester T.C.—£1,000 for an electrically-driven fan installation.

Todmorden T.C.—£10,000 for electricity plant.

LOANS SANCTIONED.

Chester T.C.—£4,500 for electric cable extension.

St. Helens T.C.—£11,800 for the electricity undertaking.

LOANS REFUSED.

Nuneaton T.C.—£1,950 for extensions of the electricity plant.

Willesden U.D.C.—£10,000 for electrical machinery and cables.

CORRESPONDENCE.

Ἐις ἀνὴρ οὐ πανθ' ὁρᾷ

One man does not see everything.)
—Euripides.

LIGHT RAILWAYS FOR THE ROADS.

To the Editor of The Surveyor.

Sir,—I was glad to see your notice of my remarks on the above subject on p. 387 of your issue of April 20th. I should like this matter to be considered by many of your professional readers, who are more competent to deal with a matter of this kind.

There is no doubt that the communications established between large centres and the country districts have come to stay, as they are a great boon to the country people who live far away from railway stations, and because they connect up villages.

The main roads in semi-agricultural counties such as this are unsuited for carrying heavy 'bus traffic, and the tram traffic, used mainly by our brewers and millers, although I admit that it will be more difficult to find a substitute for the latter, in consequence of the question of delivery to shops and public-houses. Still, there are many cases where the suggestion I make might be made available, with advantage, for this trade.

My idea is to lay a 20-in. or 24-in. light railway alongside all roads on which there is a successful motor-'bus route, and divert the traffic to these tram lines. Legislation would be required to widen roads in some cases and remove corners where necessary, although the necessity for this would not be great. These tram lines were largely used in Belgium before the war, and were found exceedingly useful. The cost of making our main roads (of which this county has over 1,000 miles) strong enough to carry this 'bus traffic would be a tremendous tax on the ratepayers, and it is my opinion that the adoption of these tramways would not only be economical but would make travelling on the roads much more pleasant, both to pedestrians, motor cars and wheeled vehicles.

Now is the time to think of these things and formulate schemes, especially as work will be wanted when demobilisation takes place after the war, and the Road Board have signified their intention to give financial assistance to approved schemes. I am aware that one of the chief difficulties will be the hills on many routes, which will require engineering skill and legislative powers to overcome.

I feel I have trespassed on your space, although it is a question closely associated with your journal. I hope the matter will be considered and discussed by any of your readers who are interested in the subject, and I shall be glad to have communications from those who have had experience with light railways, and estimates as to the probable cost from contractors who have undertaken this class of work. The figures will, of course, be based upon normal prices of labour and material.—Yours, &c.,

R. Ashton Lister.

Surveyor's Office,
Shire Hall,
Gloucester.
April 28, 1917.

[We shall be glad to have the views of our readers with regard to the proposal of Sir Ashton Lister—who, it may be mentioned, is acting as county surveyor of Gloucestershire in the absence of Mr. E. S. Sinnott.—Ed. Surveyor.]

DECIMAL WEIGHTS, MEASURES, AND CURRENCY.

To the Editor of The Surveyor.

Sir,—The last sentence in my letter, published under the above heading in your issue dated April 27 1917, should read: "Any similar expedient to mitigate the 'tyranny of the ten' as the people of [illegible] permitted to do." All over India the people use cowries to mitigate the inconvenience of 3·12 pies make 1 pice, and in Ceylon the use of cowries for this purpose has naturally been extended to mitigate the inconvenience, in small transactions, of 10.

I notice that it is claimed that the metric system is adhered to by about 127,500,000 of people, optional in [illegible] and that an International Metric Institute exists in Paris, etc., etc. I do not know whether we are expected to add all these figures together to obtain a result, but I submit that, put before the public in that form, they are distinctly misleading. We also know that in the countries where the metric system is [illegible] a very large percentage of the population continue to employ non-metric units, and cannot be prevented from doing so.

The decimalisation of British Weights and Measures based on British units is a suggestion to legalise what is common practice already. Our system admits of decimalisation to any extent desirable. There is no special courage in trying to convert a metric country to the use of the British system. It has only to be pointed out that it is a more practical and convenient form of Napoleon's *Système Usuel*. We refer three scales to the chain of 20 metres, and the *Système Usuel* refers two scales to the metre, that is all the difference. It would no doubt be better for humanity if an international metre existed and was generally adopted, but that metre ought to be constructive, and not destructive. A 39·6-in. metre, whatever the inch may be in actual length, is constructive. That is why I have always declared the issue in this country to be between a 39·6-in. and a 39·37-in. metre, the same to be divided decimally, and also into 39·6 exact parts.

The metric system, based on the 39·37-in. metre, and the British Decimal System, based on the 39·6-in. metre, stand on equally solid ground, and have both an equal claim to be considered scientific. The 39·6-in. British metre (the ancient Belgic yard) has, however, the better claims to be considered international. If (instead of adopting the 39·37-in. metre in this country, and waiting to see whether it or the yard would survive), we boldly adopted the British metre as our national metre for all purposes where a metre is more convenient than a yard, we should do well. I quite agree with the Decimal Association that two incommensurate systems cannot exist in the same country. The question is (*a*) which ought to go? and (*b*) how are the conflicting claims of vulgar fractions and decimals to be reconciled? The reply of the Decimal Association is—Adopt compulsory purely decimal systems, and let vulgar fractions fall, if possible, into disuse. Since vulgar fractions are as indispensable as decimals, I consider my solution the more reasonable—Adopt the 39·6-in. metre in the Empire, and let other metric countries fall into line if they will. There is common sense in this proposal if "majority rule" is claimed by decimalists, even on their own statistics of population.

I notice the Daylight Saving Bill is quoted as a precedent for compulsory decimals! What next? Compulsory service, food rations, and so on? Compulsion is, of course, the only means whereby the metric system and decimal coinage can be effectively introduced into the Empire. The chief objection is that the majority might find their loyalty and obedience to law strained to breaking point, especially if cowries and non-metric units were prohibited under penalties!

Figures may be made to prove anything. If I wrote to 25,000 persons and received 3,036 replies, of which 2,994 agreed with my views, I should be inclined to think that at least 22,000 were probably my opponents!—Yours, &c.,

E. A. W. Phillips, M.Inst.C.E.

Hove.
April 27, 1917.

To the Editor of The Surveyor.

Sir,—Having read in your issue of April 20th your report of the lecture given by Mr. Harry Allcock at the Institution of Civil Engineers, I venture to write to you with regard to a modification which I have already advocated on several occasions.

In the first place I think it will be admitted that the conversion of the coinage is the simplest and easiest first step to take in the adoption of the metric system, the coinage being entirely under the control of the Government.

I am entirely in agreement with Mr. Allcock's scale as regards the sovereign, half-sovereign, florin and the shilling. I would abolish the five-shilling piece, the four-shilling piece, the half-crown, and threepenny-bit as unnecessary complications.

Below the shilling, however, I submit that the adoption of cents instead of pennies and half-pennies would present such difficulties as to render the whole scheme unpopular.

My suggestion is that the sixpence should be re-christened fivepence, the coins being called in and reminted with the new name—which could be learned by everybody in a week. All copper coins should be called in, farthings should be abolished, and pennies and half-pennies reissued at the value of ten pennies to a shilling, and twenty half-pennies to a shilling. The pennies and half-pennies would re-

quire no alteration, and the increase of value accruing to tramway and omnibus companies and others might be taxed out of them with the greatest of ease.

You would then have an extremely simple coinage, entirely British in character and in name, and you would save from the scrapheap all existing coin-freed apparatus, including telephones and meters for electric light and for gas. The coins would all have sufficient variation in the matter of weight and size to make them convenient in every way.

I should be very glad to hear if any of your readers can see any valid objection to this proposal.—Yours, &c.,

G. W.

April 30, 1917.

TRAMWAY FOUNDATION RENEWALS IN DONCASTER.*

By R. E. Ford, Assoc.M.Inst.C.E., Acting Borough Surveyor.

It is perhaps true to state that Doncaster is unfortunately situated, from the highway engineer's point of view, in so far as the average ground level is only a matter of from 30 ft. to 50 ft. above sea level, which has the effect of keeping the subsoil moist. Furthermore, the underlying strata differ considerably in short distances, and afford very unsatisfactory foundations in many places for road-making purposes. To add to these difficulties, the provision of insufficiently pitched foundations by past generations has been the rule rather than the exception, even where they considered it necessary to do other than lay a thin wearing crust only. In these days of heavy, fast road traffic, it is becoming more apparent day by day that it will be essential in the near future, not only to provide more suitable wearing crusts, but to reconstruct in many instances the roadways entirely, commencing with the foundations.

The foregoing remarks apply also to the tramway track, which suffers, to a greater or less extent, from the troubles referred to. It is generally conceded that by far the most important part of a tramway track is the foundation, and that if this be good, and affords the rails an adequate bed, other difficulties which arise from time to time can be faced with equanimity.

In order to ensure a scientifically perfect under-bed for a particularly troublesome length of track, the writer advised this corporation to lay cement concrete 8 in. in thickness, reinforced with No. 9 B.R.C. Fabric. The work was carried out by contract, and a considerable amount of interest on the part of engineers and the general public was displayed in its execution. In order to anchor the rails, holding-down bolts, with circular plates attached, were threaded through the reinforcing fabric at frequent intervals and surrounded with concrete. When the foundation had partially set the nuts securing the holding-down bolt to the lower flange of the rail were tightened up, and the rails were thus mechanically and effectively connected with the under-bed. As the plates were firmly embedded on the under side of the reinforcing fabric, the whole track can be looked upon as homogeneous.

The length of track in question has now been laid twelve months, and although sufficient time has not yet elapsed to warrant a definite opinion as to its traffic-resisting capabilities being formed, it is nevertheless possible to state that no signs whatever of failure have asserted themselves, and the writer has sufficient confidence in the results attained on what is to be regarded as a trial length to adopt the same system and the same materials in further work of reconstruction of considerably greater dimensions.

In conclusion, it would appear perfectly evident that the employment of B.R.C. Fabric to resist tensional stresses in concrete for foundation work is strictly and scientifically correct, and practically possible, and that a future of usefulness lies before it as it becomes increasingly well known.

The Economy of Destructors.—A report of the Works Committee presented at the last meeting of Lewisham Borough Council showed that since the destruction of refuse at the Molesworth-street depot, began in October last, considerable economies had been effected, the nett saving within the six months being £413.

* From *Road Reinforcement* for April.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Will not all engineers who have had the good fortune to carry out works abroad where the decimal system is in vogue hail with delight Mr. Harry Allcock's strenuous advocacy of the introduction of this simple method into this country in place of our present complicated and cumbrous systems of coinage, weights, and measures? What is it that keeps this necessary reform back? Is it custom, prejudice, or ignorance, or is it the apathy and indolence of the officials in some of our very numerous Government departments?

* * * *

Is it not rather disappointing to find that although the Town Planning Act became law in 1909, and has thus been in operation more than six years, only five authorities—Birmingham, Chesterfield, North Broomsgrove, Rochdale, and Ruislip—have secured Town Planning Orders? Has this reluctance to adopt Mr. John Burns' "baby" been solely due to the outbreak of war, or were the reasons given in Mr. Rees Jeffreys' admirable paper, as published in The Surveyor of April 27th, the real explanation of this very apparent shyness of local authorities to embark on unknown seas of trouble?

* * * *

Will not the surveyors throughout the metropolitan area rejoice exceedingly at the action of the Chief Commissioner of Police in deciding that the present weight of the motor omnibus is too great, and proposing that in future it shall be reduced? Will designers and manufacturers of such vehicles be able to meet this requirement, or is it at present impossible? Is there not a well-known adage, however, that "Needs must when the devil drives"?

* * * *

Was there a word too much of praise by Sir John Cockburn, who took the chair at the recent annual meeting of the Royal Sanitary Institute, when he said that, despite the war, the annual report of the institute showed that that body had steadily continued in their efforts to conserve the health and lives of the people, had persevered in their crusade against infantile mortality, and had extended their activities to our Dominions beyond the seas, whose inhabitants fully appreciated the work of the institute? Is not the day fast approaching when the work of the Royal Sanitary Institute will be looked upon as Imperial in its character?

* * * *

What has become of "The Tyre and Road Wear Research Committee," which was formed early last year to investigate questions as to the effect of certain road surfaces on the wear of tyres, and the effect of certain types of tyres on the surface of the roads? Has the work of this committee ceased altogether, or is it merely "hung up," like so many other investigations, as a consequence of the war?

* * * *

Is not a road somewhat similar to a human being, in that it begins to wear out directly it is formed? But is there not this difference between the two, that a road will practically last for ever if it receives proper and scientific attention, whereas in the case of a human being all the attention and skilled advice it is possible to bestow will not keep it going beyond a comparatively short period of time? Can we not truly say, "*Sic transit gloria mundi*"?

* * * *

Were not the revelations as to the failure of the pipes supplying water to Coolgardie, which were made in the papers read recently at the Institution of Civil Engineers, of more than ordinary interest? Is there not plenty of scope for "failure" papers as well as "success" papers, and should not engineers be encouraged to give us papers on failures whenever they occur, and, by giving reasons for these failures, guide us in such a manner that we can avoid them in future? When will engineers learn that it is a mistake to hide the candle of failure under a bushel of successes, and realise that one failure sheds an illuminating experience broadcast?

Manchester Corporation and Coloured Labour.—A strike of labourers, coal trimmers, and stokers at the Dickinson-street electrical generating station in Manchester is threatened as a protest against the employment at the works of five coloured men.

Municipal Work In Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Belfast T.C.—Application is being made to the Board of Trade for consent to purchase of land in Hamilton-road for the erection of an electricity generating station.

Birmingham T.C.—The Baths Committee recommend the erection of public baths on land belonging to the corporation fronting to Mason-road, Erdington. They also report that they have purchased for £300 property at the corner of Aston-lane and Grosvenor-road, which they consider will form an ideal site for cottage baths.

Brighton T.C.—The town council have referred to the General Purposes Committee a proposal for the consideration of all building and other schemes after the war, so as to keep the aggregate local demand for labour at a fairly uniform level.

Bucks C.C.—A sum of £200 has been set aside by the Education Committee for the purchase of land and the erection, enlargement or alteration of school buildings, and £1,630 for maintenance and repair.

Keighley T.C.—Referring to a recommendation from the Electricity Committee that the floor of the engine-room at the electricity works should be tiled, at an estimated cost of £250, Mr. Wardle said he would like to know if the committee would not prefer golden pavements to go with the jasper walls. It seemed to him they were hardly considering that it was war-time, and that they were being called upon to practise economy. Certainly, he thought, wood blocks would be cheaper. It was explained that wood blocks would cost "six or seven times more," and also that the cost would be met out of revenue.

Swansea T.C.—A proposal is being considered for the conversion of Brynmill infants' school into a Red Cross Hospital. The War Office have consented to meet the cost of the alterations.

Willesden U.D.C.—The Hospital Visiting Committee are considering the question of hospital accommodation required after the war.

HOUSING AND TOWN PLANNING.

Glasgow T.C.—The Special Committee on housing and general town planning have agreed to erect on the Garngad-road site two-apartment houses with scullery and bath-room, and three-apartment houses with scullery and bath-room, the two-apartment houses to be on the block system and the three-apartment houses to be on the balcony system. Plans are to be prepared showing the details of the scheme.

Hereford T.C.—The Housing Acts Committee recommend the preparation of a town-planning scheme for Westfields, St. Martin's, and the area between Ledbury-road and Old Eign Hill.

Hunslet R.D.C.—It has been resolved to prepare a town planning scheme for Dulton-with-Woodlesford.

Leeds T.C.—The Improvement Committee have recommended that such members who have not already done so should visit Liverpool to inspect the new town-planning scheme.

South Shields R.D.C.—A scheme has been submitted to the council for the erection of workmen's dwellings in the vicinity of Boldon Colliery.

Uxbridge U.D.C.—The surveyor, Mr. W. L. Eves, has submitted to the Works Committee a scheme for the erection of workmen's dwellings.

MOTOR TRANSPORT.

East Ham T.C.—The collection of house refuse by electric vehicles is under consideration.

Hayes U.D.C.—The council are considering the question of providing a motor ambulance.

Worcester T.C.—The mayor has suggested the purchase of motor lorries for haulage purposes, and he considers that the use of motor sweeping machines should also be considered.

REFUSE COLLECTION AND DISPOSAL.

Woolwich B.C.—The question of the collection of waste paper has been referred to the Works Committee to make the necessary arrangements.

ROADS AND MATERIALS.

Aberdeen T.C.—The Streets and Roads Committee recommend the repair of Tillydrone-road at an estimated cost of £450.

Brampton R.D.C.—The chairman, Mr. W. Dobson, in moving the adoption of the Finance Committee's report, said the decrease in the calls were very largely due to the economical working of the surveyor, Mr. John Mark. Their roads were about the best in the county, although the surveyor had been working with a much depleted staff. The greatest credit was due to Mr. Mark, a statement which was applauded by the members.

Droxford R.D.C.—The acting surveyor, Mr. King, has been authorised to arrange with the Stamshaw Chemical Works for a supply of refined tar to the specification of the county council at 3¾d. per gallon, delivered in trucks to railway station within the district.

Durham C.C.—In view of the increased cost of travelling the council have approved a proposal of the Works Committee to make a grant of £45 to the assistant main road surveyor.

Hailsham R.D.C.—The council have accepted the tender of Messrs. H. V. Smith and Co. to carry out tar-spraying work, including apparatus, materials, and labour, at 2¾d. per super. yard.

Lewisham B.C.—Mr. E. Van Putten, the borough surveyor, has in hand about 9,000 superficial yards of woodpaving which he is executing by direct labour. The blocks are of creosoted deal, and only 3 in. in depth. This size of block is somewhat of a novelty in the Metropolis, but the reduced depth undoubtedly saves cost, and if the blocks are well bedded and jointed, should answer all purposes, as when blocks have worn down about an inch they require renewal, even if 5 in. or 6 in. deep originally.

Market Drayton R.D.C.—A committee reports that heavy tractors and motors are causing serious damage to the roads, and the council are recommended to make an appeal to the county council with respect to the consequent increased cost of highway maintenance.

Monaghan C.C.—The county surveyor, Mr. J. J. Hannigan, reporting upon road maintenance, said that, assuming the whole county to be under direct labour, in order to get the same work done as formerly, an increased expenditure of £7,000 would be required. The council left the matter in the hands of the county surveyor, and decided to raise the wages of the roadmen from 17s. 6d. to £1 per week.

Monks Kirby R.D.C.—An application has been made to the Road Board for a grant towards the cost of tar-spraying 15,000 yards of Watling-street.

Notts C.C.—In the report of the Highways and Bridges Committee it was stated that the net estimates for highway purposes amounted to £42,660, compared with £41,515 last year. About 17½ miles of reconstruction work was carried out in the year under the Road Board scheme, leaving about 19½ miles still to be done.

Oughterard R.D.C.—On the recommendation of the county surveyor, Mr. J. Kennedy, the council have resolved to adopt a direct labour scheme. It was stated that the saving accruing would be £189 a year.

Petworth R.D.C.—The surveyor, Mr. G. T. Suter, in his estimate of expenditure on highways for the ensuing year, stated that £4,680 would be required. Last year the estimate was £4,763, but the amount actually spent was only £2,790. The estimate was approved.

Richmond (Yorks) T.C.—It has been decided to renew a former offer to aid the construction of a new road between the town and a local military camp.

Shifnall R.D.C.—The surveyor, Mr. G. H. Stevenson, has received instructions to report on the con-

dition of the roads in the parishes of Blymhill, Weston and Sheriffhales.

Shoreham U.D.C.—At the last meeting the question of getting the road tarring carried out was raised by Mr. Peak.—The surveyor, Mr. A. W. Nye, said there was a great difficulty in obtaining labour.—Mr. A. Burfoot said women had done it in places.—The surveyor stated that he had had soldiers employed in the past, but intimated that the experiment had not been very satisfactory as regards the results achieved. —The surveyor said the labour difficulty was largely a question of wages.

Thurlston U.D.C.—A discussion took place on the reading of a letter from the West Riding county surveyor, in which he pointed out the difficulties of repairing and maintaining roads owing to the shortage of manual and team labour and of procuring material, and suggested an amalgamation of staffs in districts. The surveyor (Mr. R. Longden) said that one of the obstacles in the way of amalgamation was the variation in wages paid, and Thurlstone did not compare favourably in this respect.—Mr. G. Hoyland, agreeing that the wages had been too low, proposed a scale of increase all round, varying from 2s. to 4s., for the duration of the war, and this was agreed to.

Westminster B.C.—The employment of women as street cleaners has proved so satisfactory that it is proposed to engage more for the purpose.

Woolwich B.C.—The Road Board have approved the estimate of the borough engineer, Mr. J. Sutcliffe, at £1,036, for making up Church Manor-way for motor-bus traffic, and requested the borough council to carry out the work.

SEWERAGE AND SEWAGE DISPOSAL.

South Stoneham R.D.C.—The Itchen Urban District Council have served notice upon the rural council that they will cease to receive into their drainage system the sewage from Bitterne, and the clerk has received instructions to communicate with the Local Government Board for advice on the subject.

WATER, GAS, AND ELECTRICITY.

Bolton T.C.—The Committee of the House of Lords which has been considering the Bolton Corporation Water Bill have decided that it is not expedient that the bill should proceed.

Chelmsford T.C.—A scheme has been approved for the painting of the two gas-holders, the installation of a new condenser for the sulphate of ammonia plant and of a vaporizer.

Dublin T.C.—The special committee appointed by the corporation to consider the question of the administration of the electricity undertaking recommend that Mr. Ruddle be appointed for two years to take entire charge, not only of the electricity undertaking department, but also of the commercial department of the undertaking.

Lancaster T.C.—The town council have agreed to engage a consulting engineer for the purpose of advising upon an extension of the water supply, and any schemes connected therewith. The engineer will report to the Water Committee, and after a definite scheme is agreed upon a sub-committee will go into the details.

Liverpool T.C.—The city council on Wednesday agreed to the recommendation of the Tramways Committee to purchase two new cooling towers and two rotary converters and switch gear.

Oystermouth U.D.C.—The water engineer, Mr. D. M. Davies, who had been consulted with respect to the water supply, has submitted a report confirming what has already been conveyed to the council by the surveyor, Mr. W. P. Puddicombe. The steps taken have resulted so far in a reduction of the consumption from 38 to 28 gallons per head, but investigation has shown that in some special cases "unreasonable extravagances" are indulged in by consumers. The report is to be investigated by the Water and Sewers Committee, and the result submitted to the council.

St. Pancras B.C.—The borough council have pressed upon the London County Council the urgency of their proposal for a new turbine set at the King's-road electricity works, and ask that the loan for the purpose should be increased from £5,000 to £5,840.

Woolwich B.C.—In order to enable the electricity distribution engineer to attend breaksdown with the least possible delay, it has been agreed to provide him with a motor cycle at a cost not exceeding £55.

MISCELLANEOUS.

Chadderton U.D.C.—It has been resolved to discontinue the lighting of lamps in the early morning and evening during the operation of the Summer Time Act.

Edinburgh T.C.—A letter has been received from the Admiralty stating that they were in favour of the proposed construction by the corporation, after the war, of a tramway between Edinburgh and South Queensferry. This, it was said, would be beneficial to Rosyth, and the Admiralty would support the corporation in any application for a Provisional Order or bill, provided there was no actual construction carried out during the war.

St. Ives (Cornwall) T.C.—The borough surveyor, Mr. S. Palmer, has submitted a plan of the apron proposed for Smeaton's Pier, and upon the recommendation of the Harbour Committee the town council have resolved to apply to the Public Works Loan Board for a loan of £350 to carry out the work.

Stepney B.C.—It has been agreed to support the proposal of the Deptford Borough Council that it is desirable to dispense with street lighting during May, June and July, except at dangerous street corners.

SOME RECENT PUBLICATIONS.*

Depreciation and Wasting Assets. By P. D. Leake, F.C.A. Price, 10s. 6d. nett. London: Sir Isaac Pitman and Sons, Ltd.

Although this book is written by an accountant and treats of a subject which primarily interests accountants, we commend it to the serious attention of our readers because it is only by means of the study and use of better methods of dealing with depreciation and wasting assets that the annual computation of industrial profit and loss can attain the necessary standard, and become by comparison an exact science. Indeed, it may be said that it is only by the application of such up-to-date methods to many of the undertakings for which municipal engineers are responsible that any really accurate idea may be obtained as to their financial soundness. The subject is therefore one of direct interest to engineers, and this excellent exposition by Mr. Leake is well worthy a place on their office bookshelves. Moreover, in view of the questions that will undoubtedly arise between capital and labour after the war, the problem of ascertaining the annual profits of industry with something like scientific accuracy becomes one of the first social and economic importance. Mr. Leake's book therefore makes a timely appearance, and in view of the care and clearness with which it has been written, merits every success.

Crewe Electricity Department Deficit.—The Crewe Corporation electricity department lost £1,173 last year owing to the increased cost of fuel, wages, and other materials, the lighting restrictions and daylight saving.

FOR OTHER ADVERTISEMENTS
See End of Paper.

DUNMOW RURAL DISTRICT COUNCIL.

The above Council invite Tenders for the Supply of Broken Granite (1½ and 2 inch gauge), delivered to the following stations (Great Eastern Railway), viz.:—

Dunmow, 800 tons.
Selstead, 500 tons.
Thaxted, 300 tons.
Takeley, 200 tons.

Tenders (on forms to be obtained of me), with Samples, should reach me not later than the 16th inst.

A. E. SLOYD,
Clerk.

Dunmow,
Essex.
1st May, 1917. (3,404)

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

PERSONAL.

Mr. T. Wilson, one of the assistant county surveyors of Monaghan, has had his salary raised from £180 to £190 a year.

Mr. C. H. Bressey, surveyor to the Wanstead Urban District Council, has been appointed one of the delegates to a conference convened by the Colchester Corporation with respect to the county contribution towards the maintenance of main roads.

Dr. A. C. Houston, Director of Water Examination to the Metropolitan Water Board, was recently called in to give his advice on the question of a new artesian well which has been sunk on the estate of His Majesty the King at Sandringham. Dr. Houston subsequently had the honour of being received by the King at Buckingham Palace, when His Majesty

Mr. Reginald Brown, M.Inst.C.E., M.Inst.Mech.E.,

Author of the paper dealing with the Storage, Collection and Disposal of House Refuse in Greater London, which, as reported elsewhere in this issue, was discussed at a Metropolitan District Meeting of the Institution of Municipal and County Engineers at Westminster on Friday last.

graciously thanked him for the work he had undertaken.

Mr. E. P. Kindell, second engineering assistant in the surveyor's department of the Beckenham Urban District Council, has recently attained his "majority" in the Royal Field Artillery. Major Kindell, at the time of the outbreak of the war, was a Second Lieutenant in the 8th London Howitzer Brigade (Territorials), and was sent to France with his battery early in 1915. Since that day he has been almost in constant action, and last year received the Military Cross. Major Kindell is an associate member of the Institution of Civil Engineers and of the Institution of Municipal and County Engineers, and a Professional Associate of the Surveyors' Institution.

Mr. H. H. Oakes, surveyor to the Ventnor Urban District Council, was, on the outbreak of war, appointed clerk, in place of Lieutenant Tozer, and he has carried out the duties ever since. Lieutenant Tozer was reported dead as a prisoner of war in the hands of the Turks soon after the fall of Kut-el-Amara, but it was some considerable time before official news of his death was received. This made a revision of Mr. Oakes' position necessary, and it is very gratifying to feel that his services have been appreciated, not only by words, but also by a substantial increase in his salary. At their last meeting the council formally appointed him clerk until the end of the war, and placed on record their high appreciation of the valuable services rendered by him during the past two and a half years.

Mr. E. G. Mawbey, borough surveyor of Leicester, is an exception to public officials who are addressed by way of what is termed an "open letter" in the press. This open letter is not a hortatory and critical indictment of something done or not done, but the entire antithesis. Mr. Mawbey in a recent issue of the *Leicester Pioneer* takes the form of an amiable and appreciative consideration of his record as man and official. A sample will suffice as a specimen of the tone of the whole "open letter." "In addition to your undoubted professional skill," Mr. Mawbey is assured, "you had prior to coming to Leicester received a good grounding in professional experience for private firms. This had given you a good idea of organisation, and you were possessed of the faculty of getting the very best out of the men under you without using harsh or driving methods. These qualities, combined with your wide experience, assured you success in carrying to a successful issue the many and large schemes entrusted to your care by the corporation. In addition to your urbanity of character, there is a certain sweet reasonableness in conjunction with your very kindly disposition which emboldens all to approach you, from the Mayor for the time being to the humblest employee of the corporation."

Mr. Leonard Leeper, deputy engineer and surveyor of Great Yarmouth, has been appointed engineer and surveyor to the Blyth Urban District Council, Northumberland. There were fifty-five applicants for the post. Mr. Leeper was born at Bingham, Notts, in 1880, and is the eldest son of the Rev. William Leeper, M.A., Rector of Mellis, near Eye, Suffolk. He was educated at Newark Grammar School, and afterwards matriculated at the Royal University of Ireland, Dublin, where he obtained the Bachelor of Engineering degree in 1908. The following year he became an associate member of the Institution of Civil Engineers and an associate member of the Institution of Municipal and County Engineers. In 1914 Mr. Leeper obtained the first prize offered by the Insti-

Mr. Leonard Leeper, Assoc.M.Inst.C.E., New Surveyor of Blyth.

tution of Municipal and County Engineers for the best paper published during the year in the *Journal*. He has recently been appointed hon. subdistrict secretary to the Eastern District of the Institution. He served his articles under Mr. J. Wm. Cockrill, M.Inst.C.E., A.R.I.B.A., borough engineer and surveyor of Great Yarmouth, president of the Town Planning Institute, and Past President of the Institution of the Municipal and County Engineers. On the completion of his articles he obtained an appointment in the Great Yarmouth office, where he has had eighteen years' experience in the municipal development of that popular, growing seaside health resort. Mr. Leeper has been discharged from the Army.

Mr. James Forrest, hon. secretary and for many years secretary of the Institution of Civil Engineers, whose death occurred on March 2nd last, left estate valued at £13,688, with nett personalty £13,574.

KILLED IN ACTION.

Private Alex. Duthie, son of Mr. Alex. Duthie, burgh surveyor of Gourock, is reported to have been killed in the recent fighting in France.

On Wednesday, at a meeting of the Newcastle-on-Tyne Corporation Town Improvement Committee, a vote of condolence was passed with the relatives of the late Lieut. A. D. Gibson, a member of the staff of the city engineer, who was killed in action on the 9th ult.

THE EDUCATION OF THE ENGINEER.

By Michael Longridge.

President of the Institution of Mechanical Engineers.*

In the early days of our institution most engineers were trained entirely in the shops. Theoretical knowledge was uncalled for, and even held to be antagonistic to practical success. There was no supply of scientific engineers, partly because there was no demand, and partly because the places where a man could study the theoretical side of his profession were few and far between. It was only in 1840 that the chair of engineering, subsequently filled by Rankin, was established at Glasgow University. There were engineering courses in London at King's College, and courses dealing more particularly with mining and shipbuilding at the School of Mines and at the School of Naval Architecture. In the provinces there were a few technial colleges, such as the Merchant Venturers' Technical College at Bristol and the Owen's College at Manchester, though it was only in 1868 that the first Professor of Engineering, Osborne Reynolds, was appointed there. In the great centres of the iron and engineering trades apportunities for technical education, beyond what might be acquired in mechanics institutes, were practically non-existent.

It was not till 1877 that the Livery Companies in London, belying the popular idea of their activities, appointed a committee to consider the possibility of initiating a national scheme of technical education. The City and Guilds Central College was the result. Its foundation in 1880 marked the first public recognition of the need of something more than office or workshop training for the engineer. Then came the appointment of the Royal Commission, which reported in 1884, the formation of the National Association for the Promotion of Technical Education in 1887, and the Technical Education Act of 1889, which refused to the schools it governed the means of teaching the practice of any trade. In 1890 only was a real foundation laid by the transfer of the control of technical education from the School Boards to the local authorities, and the appropriation of half the "whisky money" for its support.

TECHNICAL SCHOOLS.

The result has been a vast expenditure on technical schools. Nearly every local authority has built one. These schools range from the technical school of the small borough, where engineering instruction is limited to evening classes in "engineering drawing, practical mathematics, and (I quote from the prospectus of one of them), engineering science," whatever that may be—they range from such schools to institutions of university rank like the Municipal School of Technology in Manchester, with its numerous laboratories, and among them engineering laboratories and workshops equipped with full-size modern machinery, tools and apparatus, not only of the types in general use, but also others specially designed for demonstration and experiment, where the science of engineering and the outlines of its practice can be learnt, and where research is carried on by professors of high attainments and post graduate students in connection with the workshops of the district.

Besides these we have provided engineering courses in most of our older universities, and endowed new, where science enjoys more prestige than Greek. To Oxford, Cambridge, St. Andrews, Glasgow, Aberdeen, Edinburgh, Dublin, Durham, London, we have added since the foundation of this institution, Manchester, Wales, Birmingham, Liverpool, Leeds, Sheffield, Bristol, Belfast, and the National University of Ireland.

With all these schools and colleges it might be thought that the problem of educating engineers and engineering workmen had been completely solved. Unfortunately it has not. One innate conservatism ties us too much to the traditions of the past. Many still fail to understand that the manual training which enabled an apprentice to become a master craftsman in times gone by, does not suffice to turn a schoolboy into an engineer to-day. The functions of the engineer and craftsman are entirely different, and their training must be different also. Moreover, differentiation is needed in the training of the various classes of engineers and workmen. Designers and scientific advisers require a knowledge and experience which managers and business organisers can forego without much disadvantage. Foreman and supervisors similarly need a wider range of practical experience and technical knowledge than men destined to be manual workers all their lives. This lack of differentiation seems to be one cause of the inefficiency of our technical education relatively to its cost. Another certainly is insufficient preparation of those entering the technical schools.

On the whole the education available for the higher ranks seems fairly satisfactory; at all events, it has produced men capable of solving many of the new and difficult technical problems presented by the war. Yet, on behalf of these, I would give one caution. There are many Englishmen of the best type with initiative, ability to organise, and power to lead and manage men, yet really incapable of assimilating much book learning, especially higher mathematics. Do not let us make the mistake of forcing these men through the same collegiate course as men of different mentality, and then passing them on examination with a low percentage of full marks. It would be infinitely better for everybody to keep them to more elementary work and require a high standard in examination. It is astonishing how much sound engineering can be done with the aid of $s = vt$, $v^2 = 2fs$, $P = mf$, &c., and corresponding elementary relations in other branches of natural philosophy, if only their meaning be well rubbed in, and their application clearly understood. We must not underrate these men in our new-born zeal for scientific formulæ. Many of them are of our very best.

A NECESSARY DISTINCTION.

I think a clear distinction should be made between technical colleges of university rank on the one hand and senior technical schools, whose entrance standard is lower than university matriculation, on the other. The interests of engineers require two classes of institutions giving technical instruction, each with its definite purpose: (1) Technical "colleges." (2) Technical "schools" (senior and junior).

The technical "colleges" should be of university rank, and should be departments or faculties of universities, like the Municipal School of Technology in Manchester, not independent of them, as in Germany. They should provide two courses, one for the scientific advisers and designers, the other for the managers and business organisers. They would receive their students mainly from the higher secondary schools. Admission should be by examination, or very strong recommendation by qualified persons, in the case of men past undergraduate age. The gate should be opened only to those capable of profiting by the teaching. The idea of free University education for the million is most pernicious nonsense.

Another desideratum is co-ordination of the work, especially between the higher secondary schools and what I have called the technical college, and between the elementary and lower secondary schools and what I have called the technical schools, so that pupils passing from the one to the other would be properly prepared for the change. We also need a uniform system of adequate scholarships, to enable the best intellects among the poor to go up the whole educational ladder and mix on equal terms on each rung with those better endowed with this world's goods. The number and values of the scholarships available depend at present too much upon the ideas of the various local authorities.

* Extract from Presidential Address, delivered on April 20th.

Waterproofed Cement.—There are undoubtedly many engineers, architects, and builders who have friends in France, Spain, Holland, Russia, Poland, Portugal, and Japan. Literature upon waterproofed cement has been translated into the languages of those countries, and we are asked to state that it will be sent free on request to anyone who will write to Messrs. Kerner-Greenwood and Company, of King's Lynn, the proprietors of the cement waterproofer "Pudlo."

Demands of a Housing Conference.—At the South Wales Housing Conference at Cardiff last Saturday it was decided that a demand be made on the Government for a loan of £5,000,000 to local authorities in Wales and Monmouthshire for the erection of working-class dwellings. The conference also asked for the removal of all insanitary dwellings, obligatory town planning, and the establishment of Local Government and Agricultural Boards for Wales under a separate Minister.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

CLERK OF WORKS.—May 6th.—Blaenavon Urban District Council. £3 3s. per week.—Mr. I. G. Gwyn Hughes, clerk.

ROAD FOREMAN.—May 7th.—Barrowford Urban District Council. £2 per week.—Mr. A. T. Chandler, Clerk Council Offices, Barrowford, Lancs.

SURVEYOR'S TEMPORARY ASSISTANT.—May 7th.—[illegible] Valley Urban District Council. £100 per annum.—Mr. T. A. Buckley, clerk, Council Offices, New Barnet.

ASSISTANT COUNTY SURVEYOR.—May 12th.—Staffs County Council. £230 per annum.—Mr. James Moncur, M.INST.C.E., County Buildings, Stafford.

ROLLER DRIVER.—Staffs County Council. 28s. 6d. per week.—Mr. James Moncur, M.INST.C.E., County Buildings, Stafford.

WATERWORKS ENGINEER.—Swanage Urban District Council.—Mr. W. H. Pearce, Town Hall, Swanage.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

SOMERSET.—May 14th.—For rebuilding the breast wall or back supporting the Castle Cary to Somerton main road at Lovington, for the county council.—Mr. G. R. Folland, acting county surveyor, Wells.

WESTHOUGHTON.—May 14th.—For building 100 [illegible] houses, for munition workers, for the urban district council.—Mr. George Hayes, engineer and surveyor, Town Hall, Westhoughton.

Engineering: Iron and Steel.

BOURNE.—May 9th.—For the excavation of foundations and fixing concrete engine and pump beds at pumping stations for the Bourne North Fen and Dyke Fen Drainage Trust.—Mr. S. R. Andrews, clerk, Northgate, Bourne, Lincs.

GLAMORGAN.—May 9th.—For the supply and fixing of coverings for hot-water and steam pipes, for the county [illegible].—Mr. W. E. R. Allen, clerk to the Committee of Visitors, Glamorgan County Hall, Cardiff.

MANCHESTER.—May 11th.—For the supply and erection of coal-conveying plant, for the Electricity Committee.—Mr. J. L. Pearce, chief electrical engineer, Dickinson-street, Manchester.

MANCHESTER.—May 11th.—For the supply and erection of one hydraulic accumulator and electrically-driven ram pump, for the Electricity Committee.—Mr. J. E. Hughes, secretary, Electricity Department, Town Hall, Manchester.

Mechanically Propelled Vehicles.

LONDON.—May 7th.—For the supply of one van [illegible] for the Metropolitan Asylums Board, [illegible] Embankment, London, E.C. 4.

MANCHESTER.—May 9th.—For the supply of a motor lorry, about four tons, for the Manchester Union.—Clerk to the Guardians, Union Offices, All Saints, Manchester.

Roads.

FOLKESTONE.—May 7th.—For the supply of 2,000 [illegible] to be delivered at Shorncliffe Station or Folkestone Station, for the corporation.—H. A. E. Neilson, M.INST.C.E., borough engineer, Folkestone.

ROMFORD.—May 7th.—For the supply of 60 tons of [illegible] granite chippings, and 1,000 gallons of distilled tar or other [illegible] for the urban district council.—Mr. [illegible], Surveyor's Office, Council Offices, Market-place, Romford.

SWANAGE.—May 7th.—For tar-spraying 27,000 super. yards of carriageway, for the urban district council.—The Surveyor, Town Hall, Swanage.

LOCHABAR.—May 10th.—For the supply of road metal, for the district committee.—Mr. J. Schoolar, road surveyor, Fort William, Inverness.

LIMEHURST.—May 10th.—For the supply of 2-in. broken granite, 1-in. to 1¼-in. broken granite, tarred broken granite, ½-in. limestone and granite chippings, ¼-in. limestone and granite chippings, stoneware pipes, bends and junctions, for the rural district council.—The Surveyor, Council Offices, Waterloo, near Ashton-under-Lyne.

WATERLOO.—May 10th.—For the supply of 2-in. broken granite, 1-in. to 1¼-in. broken granite, tarred broken granite, ½-in. limestone and granite chippings, ¼-in. limestone and granite chippings, stoneware pipes, leads and junctions, for the rural district council.—The Surveyor, Council Offices, near Ashton-under-Lyne.

MANCHESTER.—May 11th.—For the supply of granite macadam, granite, grit and limestone chippings, and tarred granite or slag macadam, for the Paving, Sewering and Highways Committee.—Secretary, Paving Department, Town Hall, Manchester.

WELLINGTON (SALOP).—May 15th.—For the supply of 50 tons of tar, suitable for painting, to Road Board's specification, for the urban district council.—Mr. Geo. Riley, engineer and surveyor, Wellington.

HALIFAX.—May 21st.—For private improvement works, for the Highway Committee.—Mr. J. Lord, borough engineer, Town Hall, Halifax.

ROSS AND CROMARTY.—For the upkeep and repair of the Altguish section of the Mid-Ross District roads, 15 miles long, for the Mid-Ross District Committee.—Mr. D. Matheson, acting district road surveyor, Dingwall.

BLANDFORD.—For tar-spraying and gritting about 25,000 yards super. of roads, for the corporation.—Mr. R. Lake, borough surveyor.

Sanitary.

GODSTONE.—May 9th.—For certain supplementary works for sewage disposal to be carried out at the council's existing outfall works at Limpsfield and Oxted, for the rural district council.—Mr. H. Howard Humphreys, 28, Victoria-street, Westminster, S.W.

CHELMSFORD.—May 10th.—For the provision of sanitary accommodation at the public baths, for the corporation.—Mr. P. T. Harrison, borough engineer, Municipal Offices, Chelmsford.

YEARDSLEY.—May 14th.—For the removal of refuse, for the urban district council.—Mr. W. Eyre, surveyor, Council Offices, Yeardsley, Cheshire.

TEMPLE EWELL.—May 15th.—For scavenging the parish, for the parish council.—The Clerk, Parish Council, Temple Ewell, Dover.

NEW ROSS.—May 22nd.—For the construction of sewerage works in Rosbercon, for the urban district council.—The Clerk, Urban District Council Offices, The Tholsel, New Ross, Ireland.

Miscellaneous.

HAMMERSMITH.—May 7th.—For the removal of waste paper, for the borough council.—Mr. L. Gordon, town clerk, Town Hall, Hammersmith.

BRIGHTON.—May 10th.—For the supply of Portland cement, for the corporation.—Borough Surveyor, Town Hall.

CLEETHORPES.—May 15th.—The council invite offers for the purchase of a Glover's Champion dust van, capacity four cubic yards.—Mr. Albert S. Barter, clerk, Council Offices, Cleethorpes.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

NORTH WALSHAM.—Accepted by the urban district council.—

Tar and grit.—North Walsham Gas Company, 10s. per 40 gallons.

Grit.—Cunnell & Co., Limited, 9s. 6d. per ton.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

The Bognor Drainage Contract Case.

The case of *Munro* v. *Bognor Urban District Council* (noted at p. 332 *ante*) is of very great interest to local authorities in connection with contracts for works. It arose out of a contract between the plaintiff and the council for the construction of a sewage pumping station and tank, and an outfall sewer, in amplification of certain old sewage works near the sea. The plaintiff contracted to execute the works for the lump sum of £7,922, but he alleged that he had been induced to enter into the contract by misrepresentation, and he therefore sought to have it rescinded. The alleged misrepresentation had reference to the nature of the subsoil of the site. It appears that previously to the construction of the old works, in 1878, it was ascertained by boring that clay was reached at a depth of 35 ft. Before the contract with the plaintiff was entered into, however, a new borehole was sunk, not very far removed from the old tank, and here clay was found only 18 ft. below the surface. Accordingly, in the plans and specifications of the new works it was stated that clay existed at that depth; nevertheless, the contract contained the usual clause, to the effect that the accuracy of this description was not guaranteed. As a matter of fact, however, it appears that, in proceeding to carry out the new works, the first traces of clay were not found until an average depth of some 32 ft. had been reached. In these circumstances the plaintiff, as he said, found it impossible to carry out the work according to the plans. Some negotiations took place between him and the council, and it appears that the latter were willing to allow him extra remuneration for the additional work entailed, but no arrangement was come to. As we understand it, the gist of the plaintiff's case was in effect as follows: Either the council knew that the condition of the subsoil was quite different from what they represented, or their statement was made recklessly, upon insufficient data, and without caring whether it was true or false. In these circumstances it is highly satisfactory to be able to add that, in the result, the council were amply exonerated from this charge, Mr. Justice Darling having, without the slightest hesitation, after a somewhat lengthy hearing, given judgment in their favour, with costs. In the course of his judgment his lordship pointed out that the informaton given to the plaintiff was of a general character, and that if he wanted to know more, and to have more accurate information, he could himself have made a borehole before signing the contract. The plaintiff, having thus failed to make out a case for the rescission of the contract, will, of course, be obliged either to complete it as it stands, or to make some other arrangement with the council. The main interest of the case lies in the vindication of the council from the charge of misrepresentation, but it may be noted, in conclusion, that they made a counter-claim against the plaintiff for the sum of £2,600, as damages for his failure to carry out his contract. This matter, however, stands over for the present, his lordship expressing the opinion that the parties should arrange it, both parties having, in his view, been honestly mistaken as to the depth of the clay. We must therefore forbear any comment on this part of the case.

* * *

London Road Problems after the War.

At a recent meeting of the London Society, Mr. Paul Waterhouse, F.R.I.B.A., gave an address on "London after the War," in which he discussed with insight and discrimination some of the familiar problems affecting London that will engage attention on the conclusion of hostilities. Confessing that the subject was a large one for compression into a single lecture, he nevertheless succeeded in handling it in a manner alike illuminating and interesting. Mr. Waterhouse is the chairman of a committee formed by the London Society to deal with the south side of the river, and the result of the patient study he has given to this and the question of London generally may, we think, be summed up in the sentence, "Where a town was as large as London, concentration was entirely a mistake." In discussing the road problem first of all, "because it was the problem whose claims called the loudest," he put in a plea against the accepted idea that salvation was chiefly to be found in widening. Widening, he argued cogently enough, was not always a cure. If a road was overcrowded, its state, he remarked, might be due not merely to its own inadequate capacity, but also to the fact that it was conveying traffic to a congested destination. In that case the more traffic was encouraged to frequent the road, so much the more would the trouble be increased. If the mischief is what is graphically called a "bottle-neck" trouble, no increase in the capacity of the bottle will help matters. Another branch of this subject that received critical examination from Mr. Waterhouse is the idea we have received from our forefathers of the concentration of roads at centres. The Elephant and Castle, St. George's-circus, the congestion at the south end of Tottenham Court-road,

the north end of Kingsway, Oxford circus, Piccadilly circus, the Marble Arch, and Hyde Park corner are all, in his view, "horrible failures." There is certainly much to be said for this, and it follows, of course, from such a premise that the proposal to establish in London a combined central railway station, uniting all terminal lines at a common centre, would only have the effect of making things worse. We note that this aspect received additional support from Mr. John Burns, who was one of the speakers in the brief discussion that followed the address. Given that they were to have such a "monstrosity" in London as a huge central railway station, said Mr. Burns, Mr. Waterhouse would be probably right in allocating it somewhere in the neighbourhood of Covent Garden, but his (Mr. Burns') view was that if such an abomination was erected there, anything between 200 and 300 acres of land and space would be necessary to meet the traffic requirements of the nine or ten railway companies that would necessarily go to the central station. It would make one of the most interesting parts of London unendurable, and the cost would be enormous. Mr. Waterhouse and Mr. Burns, it may be added, both favour circular roads for London. It is obvious that these great London problems will demand, as it is hoped they will receive, treatment by men who are habituated to handling large and complex issues with imagination and foresight.

* * *

Proportions for Concrete.

Long experience of the use of concrete as a material of construction has amply demonstrated that there are a large number of independent factors which may and do affect its strength. It is now well known that this essential quality of concrete depends not only upon the characteristics of the materials of which any given specimen is composed, but also upon the proportions in which they are used and the method of mixing. So far as proportioning is concerned, architects and engineers are still generally content to specify the ratio by volume of the cement to the sand and larger aggregate, regardless of the fact that it is quite impossible by this means to determine the percentage volume of cement *in the finished material*. At the last meeting of the Concrete Institute Mr. H. C. Johnson read a most valuable paper in which he described a method of proportioning the materials for concrete by which this difficulty may be overcome. It will probably come as a surprise to many of our readers to learn that the volume percentage of dry cement in finished concrete honestly mixed to an ordinary 1:2:4 specification may vary between 18 and 24 per cent. The reason for this variation, and the resulting variation in strength, of course, lies in the fact that the amount of cement specified is not based on the *finished* volume of the concrete, but on the loose, dry volumes of the other ingredients. The advantage of the method described by Mr. Johnson is that it insures a constant and ascertainable percentage of cement. From this it follows that the engineer is in a position to demand that exactly the same quantity of cement shall enter his structure, whatever may be the aggregate used, and that the contractor can determine with accuracy the correct quantity of cement that he will require. This latter consideration should go far towards popularising this form of specification with contracting firms. Mr. Johnson's suggestions are based on an elaborate series of experiments from which many valuable conclusions are to be drawn. These are set out in the extracts from his paper which will be found in another column. The main thing for engineers to realise is that the 1:2:4 method of [illegible] should be considered as [illegible] concretes made to this specification contain the same percentage of cement—a matter of vital consequence since, other things being equal, it is this percentage which practically governs the strength.

* * *

Refuse Collection and Labour Shortage.

It has been generally conceded that in the allocation of available labour to essential industries a matter of increasing importance and difficulty due regard must be had to the reasonable maintenance of those local government services which are essential for the protection of the public health. In spite of this fact, however, most local authorities are experiencing the greatest difficulty in securing the necessary labour for refuse removal and disposal, and representations on the subject have recently been made to Lord Rhondda, the President of the Local Government Board. As a result of these representations the collection and disposal of house refuse is to be placed in the list of certified occupations, except as regards men who are medically fit for general service or garrison duty abroad. Moreover, the Director-General of National Service has stated that it may be possible for his department to supply a certain number of men for this work, so far as it cannot be done by women substitutes. It can hardly be expected, however, that these two measures will in themselves prove sufficient to meet a situation which will become more serious than ever with the advent of hot weather. It therefore becomes the clear duty of every local authority to take any other steps which local conditions may render practicable. The great need is economy in labour, an end which may be attained by various means. For example, in certain instances it can be achieved by intelligent co-operation between neighbouring authorities. Again, if householders could be educated themselves to burn organic and combustible matter and to sift out cinders, a double advantage would be secured, for not only would there be an enormous reduction in the quantity of refuse to be handled, but at the same time collection could be less frequent without any danger to health. In another column will be found some other suggestions which have been made by the Local Government Board, and we are confident that in this, as in so many other ways, the Government may rely upon the cordial co-operation of municipal engineers in meeting a situation with which they are peculiarly qualified to deal.

* * *

Rural Housing and a Minimum Wage.

It may appear at first sight that the minimum wage for agricultural labourers proposed to be fixed by the Corn Production Bill now before Parliament is not a matter in which municipal engineers as such have any interest. Certainly in so far as it is a question of pure politics any discussion of it in these columns would not be appropriate. But if our readers will bear in mind what we have repeatedly said with regard to the relation between the power of the labourer to pay an economic rent and an improvement in rural housing conditions, it will be seen that the question of securing an adequate minimum wage is one which will directly affect the national housing policy. This view, at all events, is taken by the National Housing and Town Planning Council, and that body has accordingly circularised Members of Parliament, pointing out that the proposed weekly minimum of twenty-five shillings is not sufficient to enable the labourer to pay an economic rent for even the simplest and cheapest type of cottage. In the course of this letter it is pointed out that it is of vital importance that the facts as to the probable cost of cottage building at the close of the war (and the economic

rents that will be chargeable to meet all outgoings in regard to such cottages) should be clearly stated and taken into account when the proposed minimum rate of wages for rural labourers is under discussion in Parliament. The council have made a reasoned estimate of the after-war weekly budget of a typical agricultural labourer with a wife and three young children to support; and for this purpose it is assumed that he will have to pay the economic rent of the cheapest type of cottage, and that food prices will have fallen half-way towards the pre-war standard. Upon these assumptions it appears that these two items of food and house rent alone will cost him £1 2s. 8d. a week, leaving a small enough margin for clothes, recreation and other outgoings. We content ourselves here with expressing the hope that some means may be devised for so improving the economic position of the labourer as to enable him to take the fullest advantage of the improved housing which it is the expressed intention of the Government to provide.

* * *

"Domestic Purposes."

In view of the distinction which is made in many special Acts of Parliament between the charges to be made for a supply of water for "domestic purposes" and for trade or other purposes, it is very important to water authorities that the precise legal meaning to be attached to the phrase "domestic purposes" should be clearly defined. As regards the Metropolis this object was practically achieved by the decision of the House of Lords in the case of *The Metropolitan Water Board* v. *Avery*, in which it was held that the true test is not whether the water is consumed or used in the course of trade, but whether the actual purpose for which the water is used is in its nature domestic. A rather similar question was raised in the recent case of *Barrett* v. *The Ilkeston Corporation*, which arose under a local Act, sec. 83 of which provided that the corporation should not be bound to "supply with water otherwise than by measure—*i.e.*, otherwise than as a non-domestic supply—any building used partly as a dwelling-house and partly as a warehouse, or for any trade or manufacturing purpose for which water is required. . . ." The question that arose for decision was whether this provision was applicable to a beer-house; and, if so, whether, notwithstanding the decision of the House of Lords in the case above referred to, the occupier was not entitled to call for a domestic supply to be paid for on a percentage on the rateable value, in accordance with the terms of the section relating to such supplies. In the course of his judgment, Mr. Justice Bailhache pointed out that, in deciding Avery's case, the attention of the House of Lords was not directed to a section of the Metropolitan Water Board Charges Act, which was similar in its terms to sec. 83 above quoted; and he held (following *Oddenius* v. *The Metropolitan Water Board*) that the test whether a house is used for a trade or manufacturing purpose within the meaning of that section is the character of the house or building, and not the purpose for which the water is used. Judgment was accordingly given in favour of the corporation.

* * *

The Institution of Civil Engineers.

The recently issued report of the council of the Institution of Civil Engineers for the year 1916-17 shows that, although the war has naturally diverted much of the energy of the institution into new channels, the ordinary activities have, in the circumstances, been well maintained. The direct war record is magnificent, no fewer than 2,495 of the members having entered naval or military service, while 164 have made the supreme sacrifice for their country. One of the most important branches of the work of the institution in normal times is that connected with research. It is pointed out, however, that the present time is not favourable to the prosecution of extensive research, on account of the great difficulties experienced in obtaining materials, and the fact that so many engineers are engaged on war work. In spite of these difficulties, however, a committee has been appointed, under the chairmanship of Sir William Matthews, K.C.M.G., to inquire into the deterioration of structures of timber, metal, and concrete when exposed to the action of sea water in various localities, as well as measures for the preservation of such structures. Such an inquiry is of obvious national importance, and its magnitude may be gauged from the fact that it is expected that the first stage of the research will occupy about five years. Direct assistance has also been given by the institution to the cause of standardisation by making a substantial grant to the Engineering Standards Committee towards the cost of the translation of their specifications into certain foreign languages, and the addition of metric equivalents to the dimensions and measures, as well as the establishment of Colonial and foreign local trade committees.

* * *

Dustbins and the Fly Menace.

The *Cleansing Superintendent*, the official organ of the Institute of Cleansing Superintendents, has rendered useful service in calling attention to the increasing difficulties of the municipal cleansing departments through the shortage of labour. The collection of refuse has been seriously affected, and it is well to remind the Government authorities that with the approach of warm weather refuse heaps in gardens and depots will inevitably become a menace to public health, not only from the offensive odours that will arise, but more especially from the fact that they will become fertile breeding spots for flies, and that ere we are aware of it the plague of flies will be upon us. In such a case, as we are all aware, the simplest remedy is the most effective one, and this may be crystallised in the one word "cleanliness." This, however, does not appeal to everybody with equal force, and so far as the municipal authorities are concerned, its force is impaired by the lack of sufficient men to do the work properly. The *Cleansing Superintendent*, in the circumstances, makes an appeal for information as to some cheap and easy method for destroying the eggs and larvæ of flies before they have time to mature in the refuse. This is an appeal which we gladly supplement on our own behalf, in the hope that some of our readers may be in a position to make a helpful response.

The Goods Clearing House System.—A paper dealing with the proposed goods clearing-house system, which, it will be recollected, Mr. A. W. Gattie brought to the notice of the members of the Institution of Municipal and County Engineers at Blackpool in June last, was read by Lord Headley, M.INST.C.E.I., at a meeting of the Society of Engineers on Monday last. The application of the system—by which heavy goods and merchandise are mechanically sorted and distributed—would, Lord Headley claimed, do away with the extravagant waste of time, space and money inseparable from the clumsy methods of loading, unloading and shunting at the termini of all our great railway systems. Two emissaries of the Kaiser who visited the works of the New Transport Company at Battersea just two months before the war broke out spent a long time in careful examination, and took back to Germany a very full report of what they regarded as an "unequalled method of mobilisation." "It will not," observed Lord Headley, "reflect much credit on our acumen or perspicuity if we allow our worst commercial enemies to exploit the invention of Englishmen to their own advantage before we have carefully examined into its merits to see if it is not possible to utilise it to our own advantage."

A Method of Proportioning Materials for Concrete.*

By H. C. JOHNSON, M.C.I.

A comparison is here made of the usual 1:2:4 method of proportioning concrete with one in which, no matter what the aggregates may be, the quantity of cement in the finished material remains the same for any given volume.

The percentage of dry cement, by volume, contained in the extremes of 1:2:4 concrete will vary all the way from 18 per cent to as high as 24 per cent.

The proposed method ensures a constant percentage of cement in the neighbourhood of 20-21 per cent, and a specification based on the method would do at least two things:—

(*a*) Demand that exactly the same quantity of cement should enter a structure, whether it be built with gravel as the aggregate, or with broken stone as the aggregate. (Such would not be the case when it is specified that 1 2 4 must be the proportions.)

(*b*) Give a contractor or any other person the correct volume, and therefore the correct weight, of cement that the volume of the concrete in the structure will demand.

Another part of the method is that some large aggregates are given less sand than others, therefore the ratio of sand to large aggregate is not in the proportion of 2 to 4, but depends on the "workability" and weight per cubic foot of the concrete. It demands that actual tests to determine the proportions shall be made of those materials which it is intended shall go into the job, and therefore prevents an excess of fine stuff being used, as would otherwise be the case.

The tests show that the weight per cubic foot is increased from 2 lb. to 3 lb., while in one or two cases the addition in strength is as great as 500 lb. per square inch at twenty-eight days. In other cases there is an addition in strength even when less cement is used.

DETAILS OF METHOD AND TESTS.

It is well known that gravel and some other concretes, when mixed 1:2:4 are not as strong as hand-broken stone concretes, also that the larger the aggregate, other things being equal, the stronger the concrete.

(*a*) 1:2:4 gravel concretes are, on the average, about 12-15 per cent weaker than stone concretes. They contain also, on the average, 10-15 per cent less cement.

(*b*) ¾-in. aggregate concrete is stronger than ½-in. aggregate concrete, while 1½-in. aggregate concrete is stronger than either. The ¾-in. aggregate has 500 per cent greater surface for its volume than the 1½-in. aggregate.

It has been stated that there is a difference of 100 tons and 130 tons between the cement in gravel and stone concretes.

For the present we will leave out the question of strength and consider only the amount, or, better still, the volume percentage, of cement in various 1:2:4 concretes. After all, the cement is the only thing that "cements," and the more of it, all other things being equal, the stronger the concrete.

Before going further I shall assume that you will accept the results of the following facts:—

(*a*) Sand, stone and gravel are inert materials with absolutely no cementing power, and are only used to dilute neat cement because neat cement would be too expensive to use alone. (This is quite apart from the question of using neat cement alone, since no one would use neat cement so.)

(*b*) Aggregates possess voids, or air spaces, ranging from 25 per cent to 50 per cent of the gross volume they occupy.

(*c*) It is correct to speak of a 1 2 4 mix as a 1 6 mix, since it may convey the impression that 6 parts of sand mixed with 1 of cement is the same as 4 parts stone and 2 parts sand with 1 of cement.

(*d*) It is generally considered that a 1 2 4 mix gives a final volume of slightly over 4 parts, so that the quarter of the mixture is correct.

It is very necessary to state that all measurements were made by loose volume on the proportion 4 large aggregate, 2 small aggregate, to 1 cement, just as would be made on the job.

The experiments illustrate the following facts:—

(*a*) 1:2:4 concrete No. 10 contains 29 per cent more cement than 1:2:4 concrete No. 2.

(*b*) Stone concretes on the average contain 10 per cent more cement than gravel concretes. It is therefore not fair to expect gravel concretes to be as strong as stone concretes.

(*c*) The percentage of voids in gravel being smaller than in stone, less sand should be used—1½ parts sand (on the average) to 4 parts gravel will produce a concrete worked as easily as, if not more easily than, 2 sand to 4 stone.

(*d*) Gravels passed through and retained on screens as used for stone always have less voids; the popular idea is that they would be the same. It can be admitted that if stone could be "hand placed" into a receptacle, a very small percentage of voids would result. This indicates that stone concretes, unless they had considerable sand (2 to 4), would not be so reliable as gravel in the matter of density.

(*e*) Gravel concretes mixed 1:2:4 are 3 lb. per cubic foot lighter than stone concretes. Proper proportioning will easily make up this 3 lb., in spite of the fact that the specific gravity of gravel is only 2·51, as against 2·70 for stone.

I have used the terms large aggregate and small aggregate on purpose to draw attention to the fact that sand is only finer gravel, or granite or quartz, is an inert material just the same as the larger materials, and has to be "cemented" by the cement just as the larger particles. It is no use talking of mortar filling the voids, or anything of that sort. Mortar is used by bricklayers and masons to bed two plane surfaces together; concretors use inert aggregate and cement with which to bind it together; but the outstanding fact is that the smaller the aggregate (all other things being equal) the weaker the concrete. There is no need to quote authorities; they are many, and have established the fact. In view of this last, the less fine aggregate (sand), providing a thoroughly workable concrete is produced, the better.

Statements have been made, and tests devised to prove, that—

(*a*) Reducing the percentage of voids to the absolute minimum possible, and filling these with cement, produces the strongest concrete.

(*b*) Any cement beyond that necessary to fill these voids is waste, and does not increase the strength.

(*c*) Just as a carpenter uses the minimum of glue in making a joint, so one should use a minimum of cement in making concrete.

It may be admitted that, all other things being equal, the more cement the stronger the concrete. Gravel concrete has suffered for years, because for apparently equal quantities of cement it is not as strong as stone concrete.

The whole trouble lies in the fact that the amount of cement is not based on the finished volume of concrete.

GRAVEL AGGREGATES *v.* STONE AGGREGATES.

I speak of gravel concrete having suffered for years because, when mixed 1 2 4 it is not usually so strong as broken stone concrete, this is because many engineers will not look at gravel as an aggregate if they can get broken stone. If I have succeeded in showing that it is not fairly treated in the matter of cement content, and if, later on, I also succeed in showing that it is unfairly treated in the matter of sand in combination with it, I shall believe that it will be considered equally as good as, if not better material than, broken stone.

LARGE AGGREGATES *v.* SMALLER AGGREGATES.

If we can, let us consider ourselves small enough to be able to wander about in the interstices of two different mixes of concrete—in one case a large aggregate concrete and the other a smaller aggregate concrete.

We would find in each case that small globules of air had attached themselves to the surfaces of all the materials making up the concrete, we would also find that, owing partly to the "bridg-

* Extracts from paper read at the last meeting of the Concrete Institute.

ing" of all the particles, and partly to insufficiency of very fine material, there would be other passages and cul-de-sacs, then there would be some particles of cement engaged in sticking to the surface of the inert material, while still other particles would be sticking together in pairs and in threes and fours.

In the large aggregate concrete we would find that, owing to the smaller surface area per unit volume of each piece there would be less cement adhering to the inert material and more cement particles in contact with one another. There would also be a smaller total length of passages and cul-de-sacs.

Now, I suggest we assume that each cement particle where it comes into contact with inert material has an adhesive value of one, but where it comes into contact with another cement particle it has a cohesive value of two or thereabouts. If, then, we have a smaller surface area per unit volume in one aggregate than another we must have a greater cohesive value, and therefore greater strength.

Large aggregates should have large sand, while smaller aggregates should have small sand. Even very fine sand, if of first quality, will give a concrete as strong as one with coarse sand if properly proportioned—*i.e.*, less of it used, which will be the case if the correct proportions are found by a trial mix in which one must aim at producing the heaviest concrete using those materials.

Having now decided two things—(*a*) that any concretes made up for comparative test values of different aggregates should all contain the same percentage of cement, and (*b*) that some large aggregates do not require so much sand as others, we (in the University Laboratory, Cork) proceeded to make up what we were pleased to call "Corrected concretes" and also 1:2:4 concretes for comparisons of cement content and strength.

MATERIALS USED IN THE TESTS.

For these specimens we mixed two brands of cement—

(*a*) South Wales P.C. Co.'s.
(*b*) Magheramorne P.C. (A.P.C.M.).

We had the following aggregates:—

Co. Cork sandstone gravel.
Co. Kildare limestone gravel.
Co. Cork crushed sandstone.
Co. Cork hand-broken limestone.
Co. Wexford fine quartz sand.
Leighton Buzzard sand, kindly supplied by Joseph Arnold, of Kentish Town.

All large aggregates were washed and passed over the following screens: ¾, ⅝, ½, ⅜, ¼, ⅛, and only material passing the ¾-in. and retained on the ⅛-in. screen was used.

The fine sand was so fine that two-thirds of it passed the 1/50-in. sieve. The Leighton Buzzard sand was the run of the pit, and varied between 1/10 in. and 1/40 in.; it is really a medium sand, but we called it our coarse sand since the other was so fine.

Each aggregate was made up with both fine and coarse sand, thus giving eight sets of specimens.

CONCLUSIONS.

(1) The 1:2:4 method of proportioning should be considered obsolete, since no two 1:2:4 concretes contain the same percentage of cement, neither does it allow the majority of materials to produce their best values.

(2) An actual test of the materials it is proposed to use should be made, introducing the percentage of cement required for the particular purpose the concrete is for and finding the ratio of small to large aggregate accurately by this means.

(3) Other things equal, the percentage of cement closely governs the strength. Other things equal, the larger the aggregate the stronger the concrete.

(4) Previous tests proved that washing the average aggregate carefully will allow 30-40 per cent higher strength in a hand mix, but only about 15-25 per cent in a machine mix. This is always excepting really dirty material.

(5) Using a mixer and giving two to three minutes for mixing will give a concrete, other things equal, about 50-75 per cent stronger.

(6) For equal working consistency and equal cement gravel concrete is as strong as stone concrete.

(7) Gravel passing same screens as stone always has less voids than the stone.

(8) Fine sand concrete has smaller weight per cubic foot than coarse sand concrete.

(9) Fine sand plus large aggregate (without cement) gives smaller volume than coarse. Fine sand plus large aggregate (with cement) gives larger volume than coarse.

(10) Fine sand concrete is easier worked than coarse sand concrete for equal amounts of sand.

(11) The finer the aggregate the more deleterious material and air it carries with it into the concrete.

(12) The finer the sand the less should be used.

(13) 30-40 per cent higher strengths are obtained with 3·16-in. cubes than with 6-in. cubes.

(14) Small cubes are more uncertain and inconsistent in the strength values than larger cubes.

(15) In the future, and in order that tests at various places shall be truly comparative, two things are required—(*a*) The percentage of cement in the concrete; (*b*) the strength of the cement in mortar tension or mortar compression.

ROAD WORK IN SHANGHAI.*

By Charles H. Godfrey, M.Inst.C.E.,
Engineer and Surveyor.

The surfacing of the roads of Shanghai with bituminous material has been carried out rather more extensively than in past years. The results may be said to be eminently satisfactory, a good road surface being formed by the treatment and the life of the road being materially increased.

During the year physical and chemical tests have been carried out on various bituminous materials with a view of ascertaining their relative values for dust prevention, road preservation and road construction. Mechanical analyses have also been made of the various kinds of sand and stone used in bituminous road construction. The results of the foregoing tests have been tabulated, and it is hoped by means of the laboratory control, coupled with the actual practical trials on the roads, to ascertain with certainty which of the various materials that have been and are being used are best suited to the somewhat peculiar conditions appertaining to Shanghai.

RECORDS.

In connection with road works in general, records have been drawn up and filed during the year wherein is recorded in both diagrammatic and statistical form the history of each road under the control of the council. These records are such that, as far as is known, there is indicated the present construction of the road, both as regards the foundation and the surface, the nature of any alterations that have recently been effected in the construction, and any maintenance work that has recently been carried out. As any new work or maintenance work is completed in the future this will be duly indicated in the files for the particular road affected and so a complete record of each road will be maintained. The files, whilst being very useful in the present, will prove more and more valuable as times goes on. They will indicate, amongst other items of interest in regard to roads, which particular forms of construction are best adapted to local conditions. It will also be possible to keep a check on the nature of any maintenance work which may be carried out from time to time on any particular road and to locate, by means of the frequency with which such work is recorded, any defects in its quality.

As a complement to these files, plans are being prepared, from surveys recently completed and drawn to the scale of 50 ft. to the inch, on which are shown details of all existing works on the roads. The sizes, depths and positions of the following underground works, so far as it is possible to ascertain, are being recorded, viz.: Sewers, gas mains, water mains, telephone cables, electricity cables, telegraph cables and tramway cables. Items above ground recorded are the following: Electric lamps, gas lamps, hydrants, standards, &c. Any alterations or additions will be duly recorded. The preparation of the plans is well in hand, and when completed will afford, together with the road files, complete information in all respects regarding each road.

Ten Million Contract Terminated.—In view of unforeseen difficulties which have arisen, owing to the continuance of the war, in the obtaining of plant, materials, &c., the contract for £10,000,000 entered into in 1914 between the New South Wales Government and Messrs. Norton, Griffiths & Co. in connection with public works supervision has been terminated by mutual consent.

* Extract from Report for 1916.

Collection and Disposal of House Refuse.*

By C. H. COOPER, M.INST.C.E., Borough Engineer of Wimbledon.

If a Londoner who departed this life one hundred years ago were to return to town, he would find one, and only one, undertaking that showed no improvement, namely, the method of collecting house refuse, except so far as the fixed ash-pit had been superseded by the movable pail. Refuse is collected from all houses whether invaded by disease or not. Such refuse should, therefore, be treated as infected. Yet no means is taken to cleanse or disinfect the pails or to prevent the air of our streets being contaminated by the refuse which is shot from the pail into the dust van. To-day it is recognised that fleas convey the infection of plague; lice convey the infection of typhus; bugs convey the infection of relapsing fever. And with this knowledge we continue a method of collection that allows our dustmen to be covered with vermin, which they carry home to the discomfort and danger of their families. The dustmen, cart, and horse of one hundred years ago might well be used to represent the unit now at work removing house refuse. The very worst mechanical feature of the plant is being perpetuated in the latest motor vehicles, namely, the dust ladder up some four feet of which the dustman has to raise his own weight; and that of the dust pail and its contents, some eighteen stone in all, which absorbs 1,168 foot lbs. of manual labour each time a pail is emptied. I estimate that at least 100 men are required in London on account of the labour absorbed in this operation, which, if low-bodied vehicles were adopted, could be utilised in other ways, say, in agriculture or the manufacture of munitions.

The electrically-propelled vehicles used in Paris and New York, &c., have low bodies so that pails can be emptied from the shoulder when the dustman is on the ground, thereby dispensing with the dust ladder.

The dust ladder is a fruitful source of accidents, for if the horse goes forward when a man is on a ladder, the man is sure to get a nasty fall.

The system of collecting that seems to guard best against the spread of infection is that adopted in Florida, where the pails are standardised, and a large number of spare pails provided, so that when a collecting van leaves the depot it is loaded with clean pails that have been disinfected. When the dustman calls at a house he takes one of these pails, which he leaves in place of the pail he removes and places on the van, no attempt being made to empty the pail till it reaches the depot. By this means the contents of the pail is not disseminated so as to pollute the air of the street, whilst the cleansing and disinfecting of the pails at the depot insures a clean pail remaining near the house. The dustmen who remove these pails with covers on are not subjected to the filth and dirt that our men have to put up with.

FREQUENCY OF COLLECTION.

The period allowed for refuse to remain near a dwelling is important. The period generally adopted is a week, but in warm weather refuse becomes offensive after three or four days. I hold the opinion that refuse should be collected once a day from houses where the pails are placed in the forecourts. The system of daily collections has been adopted at Teddington and various other districts, and has proved less expensive than collecting once a week: this is due mainly to the fact that the pails can be collected rapidly, as no time is lost in proceeding to the rear of houses and calling to ascertain if the people are at home and want the dust cleared. As the men are under observation, the system lends itself to better supervision.

Daily collections entail the labour of placing the pail in the forecourt on the householders, which is much objected to.

The value of food-stuff contained in house refuse appears to be such that a separate small pail might be provided for its reception. There are no figures that I know of from which to ascertain the amount of this food-stuff. Not many years ago contractors made their living by collecting such food stuff for pig-keepers; the amount of such food-stuff has decreased, at the same time the value of the fat contained has increased from 20s. to £20 a ton.

By sifting out cinders a householder can materially reduce his coal bill, whilst ashes, bones, and vegetable matter, especially if the vegetable matter is burnt, form good garden manure. That a householder should put garden refuse into a dust-pail is nothing short of a crime.

I trust that, so far as the collection of house refuse is concerned, I have shown that practically no attention has been given to (1) Improve the condition of the dustman, who is called on to perform work of a most degrading character; (2) Prevent the contamination of air and the spread of infection by house refuse; (3) The insanitary condition of dwellings from filthy dust-pails being left close to such dwellings; (4) The question of economy of collection.

DISPOSAL OF HOUSE REFUSE.

The war has shown us the fallacy of what we have been taught to regard as sound finance, namely, that attention should be confined to those undertakings which showed a profit, whilst local authorities should adopt such methods as entail the lesser burden on their ratepayers without any consideration whatever as to the effect that such method had on the resources of the nation.

We have under our very eyes a flagrant instance of this policy which loses the nation at least £1,000,000 a year, probably far more. I refer to the method of disposing of the sewage sludge of London, inaugurated by the late Metropolitan Board of Works and perpetuated by their successors, the London County Council. More than 2½ million tons of this sludge is sent to sea to the destruction of fishing grounds which formerly supplied much of the fish food of London, whilst the agriculture of the country is deprived of the manurial value of this sludge at a time when it is impossible to procure the manure required to produce the food now so urgently needed.

Dr. Rideal, in a paper he read before the sewage works managers in December last, gave the value of nitrogen in sewage, at the present prices, as £105,000,000 a year, and yet we find London, Liverpool, Glasgow, Belfast, and other towns sending their sewage sludge to sea when a ready market could be obtained for it as a manure.

MANURE FROM HOUSE REFUSE.

The food supply of this country is dependent on the supply of manure, and the shortage there is in the manure supply is most serious. Owing to the depletion of horses, horse manure is hardly obtainable, whilst much of the artificial manure formerly used came from abroad. Let us consider how this shortage in manure can be met by house refuse, which has a fair manurial value.

To take it that the refuse from half the population of this country is cremated in destructors would be an under estimate: this gives 4,500,000 tons per annum, having a manurial value of about £500,000 when rotted. I take the case of a district that has adopted a rational method of disposing of its refuse, and one which has resulted since its adoption of a saving of at least £15,000 to its ratepayers. This district is Southwark, where crushers were introduced in 1906, and have since been increased, so that for some years all the house refuse of the borough has been crushed, so as to form a poudrette, which is sold to farmers. The manurial value of this poudrette is about 2s. 6d. per ton.

Although destructors are not supplying an output which has a manurial value, good roads may be made with the clinker they produce, by breaking and treating such clinker with tar, pitch, or bitumen, as is done in Fulham, Hornsey and Worthing. These roads have a fair life, and are economical to maintain, and capable of carrying heavy motor traffic, such as motor buses.

Since the outbreak of war, no market can be found for the tins and scrap iron collected which formerly went to Germany, where I am told it was subjected to a moderate temperature in the presence of chlorine.

SIFTING AND SORTING.

One hundred years ago "a very profitable business" was the sifting and sorting of house refuse. Twenty years since, such sifting and sorting was in

* From a paper read at a meeting of the Royal Sanitary Institute on Tuesday last.

operation in several districts. This was done partly by machinery and partly by hand. I cannot find that any of these plants are now at work, but the following are typical cases:—

In Glasgow the refuse was conveyed by belts, from which the various materials were collected by sorters stationed along such belt.

Paddington had a plant erected by the late surveyor, Mr. G. Weston, which consisted of a series of screens; the material remaining on these screens was shot on to sorting tables, where the various materials were separated by hand. What passed through the last, that is, the finest screens was loaded into barges and sold to brickmakers and farmers.

The Refuse Disposal Company in 1891 had a plant in work at Lots-road, Chelsea. This consisted of three series of revolving screens, and all dust from and paper remaining on the screens was extracted by exhaust air, the paper was arrested, while the dust was carried to the furnaces that produced heat where it was burnt. The paper arrested was cleaned and worked into pulp from which brown paper was made. The material remaining on the first and second series of screens was passed on to a revolving table where it was sorted by two boys, ashes and breeze being separated in the last or finest screens. The output from the plant consisted of bottles, metal, fuel briquettes, manure poudrette, brown paper, cinders, and breeze.

Since the war the calorific value of house refuse has decreased, but that of ashes from power plants has increased owing to the coal used containing slack, which passes between the bars where mechanical stokers are used. Briquettes made from such ash could be sold for 10s. to 12s. a ton, and would help to supply fuel for our less prosperous neighbours.

DISCUSSION OF MR. COOPER'S PAPER.

Sir Henry Tanner, chairman of the council, presided at the meeting of the Royal Sanitary Institute at which the foregoing paper was read on Tuesday.

A vote of thanks to Mr. Cooper was proposed by Mr. H. Percy Boulnois (Westminster). The author, he observed, had struck the right note in his paper. We were at war, and the war had brought home to us the necessity for economy in every direction. We were wasteful before the war. We had been content to dispose of house refuse by burning it, but we were now waking up to the fact that in that refuse there were materials of considerable value. As Mr. Cooper had said, we had made great strides in the matter of the temporary storage of refuse and in its ultimate disposal, but so far as he could see we had made no progress in the method of collection. He regarded it as a great mistake for local authorities to employ contractors in the work of house-refuse removal—he had heard that contractors were complaining that refuse was no longer of the same value as it was before the war. He thought that by mechanical and sanitary means the valuable materials in refuse could be extracted and the rest burnt. Mr. Cooper had pointed out that two and a half million tons of London sewage sludge was wasted by being dumped at sea instead of being made use of for agricultural purposes. We knew sewage sludge contained nitrogen, but to extract and get the value of that nitrogen meant an enormous expense. There was a grain of gold in every ton of sea water, but it had been found that the cost of evaporating the water and drying the sludge to get that grain of gold was greater than the value of the metal recovered. It was the same with the nitrogen in sewage sludge—its extraction would not be profitable from a commercial point of view.

Mr. G. F. Carter, borough engineer of Croydon, said he questioned whether there was much calorific value in house refuse at the present time. It required so much reinforcement that in the end it was scarcely a commercial proposition. There might be something in the manurial value, but, like sewage sludge, it was a matter of £ s. d. He could not help thinking after all that given the destructor and good clinker, perhaps one of the best ways of utilising the material was in connection with road work.

Mr. W. R. Hicks, borough engineer of Ealing, said he thought Mr. Cooper had adopted a too pessimistic tone, and had hardly made out his case with regard to the conditions under which the work of collection was carried on. Things were very different now. Modern vans were provided with wind guards, so that three-quarters of the vehicles could be covered at a time. Mr. Cooper had condemned the use of the ladder, and suggested that vans should be much lower built. That was all very well for some localities, but where one had to tip on the flat the foot pounds of energy one gained in loading would be lost in unloading. The dual pail system was advocated, but municipal engineers had to keep an eye on expenditure. At Ealing he had 15,500 houses to deal with, and if two receptacles were provided for each of those houses it would mean the provision by the council of 31,000 bins. The price of bins at the present time was about 12s. 6d. each—which was rather cheap—so that it would cost them something like £20,000. He was one of those who considered that local authorities should compel householders to place their bins in their forecourts for a daily collection. He was aware that Mr. Hainsworth had experienced considerable difficulty in carrying out his scheme for a daily collection at Teddington, but he looked upon the system as an economical one, and one which, if adopted at Ealing, would enable him to reduce the present expenditure. Following upon the circular of the Local Government Board dealing with the utilisation of waste foodstuffs in house refuse, he issued 5,000 notices appealing to householders to keep such materials separate from the ordinary refuse, but had received only about 100 replies, and the first collection amounted to only about a hundredweight, though the latest was three times that quantity—and that in what might be called a good-class district. They were, however, going to persevere, though personally he did not think there was such a waste of foodstuffs as was generally believed. The dust manipulator was very useful in certain cases, but if every authority in Greater London adopted it the result would be that in the end the market for the material produced would be spoilt. As regarded tins, he believed Ealing was the first place to instal a press for dealing with these. The press was worked by their sludge-pressing plant. The tins were pressed into bundles, loaded on to rail, and sent away to the foundries, and they were getting twice the revenue they did before the war. They did not, of course, recover the tin, but he hoped to recover the solder. In the year ended March last their net revenue from waste paper was over £350.

Mr. E. Willis, engineer and surveyor to the Chiswick Urban District Council, agreed that there had been a serious drop in the quantity of house refuse, his estimate being that there had been a decrease of between 20 and 25 per cent since the year preceding the war. The quality of the refuse affected the whole question. In the north the calorific value was much higher than in the south, so that one scheme for the whole country was impracticable. Unification of districts would not be a panacea; each locality required to consider the nature of the material it had to deal with, and then act accordingly.

Mr. A. Harrison, borough engineer of Southwark, supported the idea of the unification of districts. With a good man in control of a number of districts much could be done in recovering from refuse material that was of value—material that was not waste, but material that was in its wrong place.

The vote of thanks was passed, and Mr. Cooper made a brief reply. He was surprised to hear anyone against unification in a place like London. We had undoubtedly far too many dust destructors and sewage works, and it would be far cheaper if they were put under one authority. Finally, he asked whether there was not a danger if people consumed all their house refuse that they might destroy valuable materials.

LABOUR DIFFICULTIES: L.C.B.'s SUGGESTIONS FOR ECONOMIES.

Representations have been made to Lord Rhondda by a number of authorities that the collection and disposal of refuse is becoming extremely difficult, particularly because of the shortage of labour. Lord Rhondda has been in communication with the Director-General of National Service on this subject. The Director-General fully recognises that the scavenging and collecting work of local authorities is of national importance, and he thinks that it might be possible for the National Service Department to supply a number of men for employment on this work, so far as it cannot be done by women substitutes.

Lord Rhondda has also been in communication with the Reserved Occupations Committee. In the committee's view, it is not possible, having regard to the general situation, to include in the List of

Certified Occupations any man who is classed as fit for general service (A) or for garrison duty abroad (B), but with these exceptions it is the committee's intention to include the collection and disposal of house refuse in the next List of Certified Occupations.

It is imperative, the Local Government Board state in a circular to local authorities, that those bodies should do all that they reasonably can to economise labour in connection with scavenging and other work, and that in particular they should consider whether any measures of co-operation with neighbouring authorities could be adopted which would be of assistance.

Among measures which may with advantage be taken to economise labour the following are suggested for the consideration of local authorities:—

(1) *Economies in the waste to be collected.*—Householders should be encouraged to sift out and to burn cinders, leaving only the dust to be collected. This is the more necessary because of the importance of [illegible]. As previously pointed out, kitchen waste, paper, cardboard, &c., is now so valuable that its separate collection is desirable. It will often be possible to arrange that waste of this kind shall be collected privately for private use if its public collection is not found advantageous. Where it is wholly impracticable to arrange for the separate collection of this kind of waste, householders should be directed to burn it.

(2) *Economies in collection, cleansing, &c.*—The refuse might be collected at less frequent intervals. The needs of public health have to be borne in mind, especially when the weather becomes hot, but if organic waste is separately collected, or, in the last resort, burnt, there should be little risk from a less frequent collection of the other waste. So far as is reasonably possible, householders should be required to place bins where they can be emptied with least labour. Some economy in street cleaning may also be possible and lead to a saving of labour.

(3) *Disposal of refuse.*—Difficulties have arisen in a number of cases where refuse is burnt in a destructor, because of shortage of staff for working the plant. In other cases, where the refuse is taken away a long distance, transport difficulties have been serious. Emergency tips may in some cases be formed, the refuse to be carted away later when labour can be more readily obtained. Where measures of this kind have to be adopted it becomes, of course, still more imperative that organic matter should not form part of the refuse.

(4) *Economies of labour.*—Every endeavour should be used to make the different staffs of local authorities interchangeable, and to use the strong men for work for which strength is essential. By the proper classification of labour it may be found possible to make more use of men of lower physical standards, and also of women, a considerable number of whom have already been employed by some local authorities.

HOUSEHOLDERS' OPPOSITION TO DAILY COLLECTION.

At Putney there was inaugurated on Tuesday of last week a system which provided that occupiers of tenements should put their refuse in a covered pail or basket which was to be placed daily at stipulated hours on the kerb of the footpath for subsequent removal. So great, however, was the agitation against the new arrangement that the town council on Friday—just three days later—decided not to proceed with it. It was stated that householders who had been willing to give the new system a fair trial had been molested and insulted, and in some instances subjected to personal violence.

Oswestry's Water Supply.—The Oswestry Town Council on Tuesday decided to ask the permission of the Local Government Board to borrow money to increase the water supply. It was stated that even if the second dam upon the Liverpool Corporation for the full quantity permitted by law there would be a shortage amounting to [illegible] gallons a day in the summer unless pumping plant were taken.

Cost of Halifax Corporation Litigation.—The total cost paid by the Halifax Corporation as a result of the [illegible] v. *The Halifax Corporation* amounted to £1,281, including £620 damages. In the action of [illegible] v. *The Halifax Corporation* the damages and costs borne by the corporation amounted to £1,076. The litigation arose out of claims for damage caused by flood at the time of a heavy rainfall, and its total cost to the Halifax Corporation has been £2,357.

WASTE PAPER ECONOMIES.

By W. H. Maxwell, Assoc.M.Inst.C.E., Borough Engineer of Tunbridge Wells.

The present shortage of paper should have the effect of directing special attention to the prevention of waste, but, in almost every direction, it is still possible to see misuse and waste of this material occurring.

In the public thoroughfares of most towns large quantities of paper are still being thrown away in the form of handbills, trade advertisements, and other printed matter. By these means not only is paper wasted, but the streets are daily littered with discarded handbills and such like. This material has to be periodically cleared at the public expense, and entails the employment of extra labour, which, perhaps, may at the present time be more usefully employed in other and more productive directions.

A statutory prohibition exists whereby it is illegal to throw refuse and rubbish into the public thoroughfares, but it is unfortunate these powers are not more generally known and enforced.

Another prominent source of the paper nuisance in streets arises from the numerous advertisement hoardings and posters with which all towns are disfigured. On wet and windy days these hoardings are promptly stripped of their paper exhibits, which are soon to be seen rolling up and down the adjacent roadways, and so adding their quota to the cost of clearing.

Quantities of paper, of almost every variety, are regularly consigned to the household dust-bin, this being in the majority of cases the most handy method of "getting rid" of unwelcome accumulations. During the past year the writer has been responsible for collecting and baling large quantities of this material, and placing it into the proper channels for paper and cardboard manufacture. In his town large quantities of mixed waste paper, periodicals, and newspapers have been thus rescued from the dust-bins and sold for useful purposes, thereby realising a profit to the ratepayers of about £350 after payment of all expenses.

Many municipal authorities are doing useful work in this direction, as well as in the utilisation of other waste materials, such as scrap metal, tin, bottles, and so forth, but a universal collective effort is needed to rescue this country from the inexcusable reproach of being what has been described as "the most extravagant and wasteful nation" on the face of the earth.

THE METRIC SYSTEM.

LORD BALFOUR OF BURLEIGH'S COMMITTEE.

In the House of Commons the Prime Minister was asked if he would state the names of the members of the Sub-Committee of the Reconstruction Committee who are considering the question of the adoption of the metric system of weights and measures and a decimal coinage; whether this Sub-Committee had invited representative individuals or bodies to give evidence; if so, whom and what bodies; and whether, in view of the urgency of the question, the Sub-Committee had been requested to report within a specified time.

Mr. Bonar Law said the question of the adoption of the metric system of weights and measures and a decimal coinage was under the consideration of Lord Balfour of Burleigh's Committee on Commercial and Industrial Policy after the War. He understood that the Committee was taking a considerable amount of evidence on the subject, but he was unable to give a list of the witnesses. The Committee was fully aware of the importance of the questions involved.

Road Damage by Timber Haulage.—At the last meeting of the Machynlleth Rural District Council, the surveyor, Mr. R. Williams, said he estimated that the damage caused to one road by timber traffic was £102. A number of timber merchants attended to discuss the matter with the council, and one of them said he thought the estate owner should make a contribution towards the cost. An estate agent, on the other hand, said it was the timber merchants who made the profit. No definite arrangement was made, but one large firm provisionally agreed to pay the council 4d. per ton for timber carried over the roads.

Multiple-Arch Dams.

By L. R. JORGENSEN, M.AM.SOC.C.E.

[*Concluded from last week.*]

The design shown in the foregoing illustrations was made by the writer for the Pacific Power Corporation, of Bodie, Cal., to be used for the construction of their Gem and Agnew Lake dams, on Rush Creek, Mono County, California. Fig. 7 is a plan of the Gem Lake dam and dam site, and Fig. 8 shows the Agnew Lake dam site. On Fig. 7 is also indicated the outlet works, consisting of a concrete chamber provided with a row of iron bars in front, and a 48-in. steel pipe laid through a tunnel for about 300 ft. This pipe line terminates in a power-house 1,808 ft. below (in elevation) the top contour of the lake. The maximum

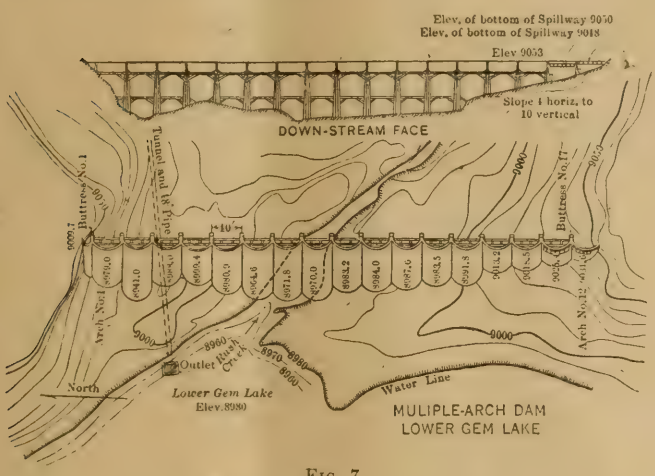


FIG. 7.

height of any individual arch of this dam is 84 ft., and the vertical distance from the deepest point in the foundation to the crest is 112 ft. The length across the dam site at the crest (elevation 9,053) is 700 ft. The reservoir created has a capacity of 17,000 acre-ft., and is capable of regulating Rush Creek to yield an estimated average flow of 45 sec.-ft. The drainage area above the dam is 22½ square miles, and is on the eastern slope of the Sierra Nevada Mountains. Its elevation ranges from 9,000 ft. above sea level at the dam to 12,000 ft. along the crest of the mountains. The precipitation at these elevations is still high, but decreases very rapidly from the foot of the steep mountains out over the desert immediately east, at elevations ranging from 6,000 to 7,000 ft. above sea level.

The rock at the dam site, for the most part, was exposed bed-rock worn clean by glacial action. Some excavation, however, was necessary in the stream bed and through a rock slide at the north abutment. The building material for the dam was found near-by. The sand was taken from the shore of the natural lake. The rock had to be hauled a short distance on a tramway, first from the outlet tunnel dump (limestone), and later from a large rock slide (granite) about 2,500 ft. away. All available materials in the neighbourhood, especially the different sand deposits, were tested before any particular material was selected for construction. As the sand deposit along the shore of Gem Lake was good, it was used. This sand was first pumped and later shovelled from the lake, and transported to a storage pile near the mixing plant. This lake sand, which contained 3½ per cent of clay and 1 per cent of dirt, was mixed with the sand from the rock crusher (all particles being less than ¼ in. in diameter) in the proportion of about three-fourths of lake sand to one-fourth of crushed rock sand. This gave a very good combination, both as to strength and water-tightness.

Compression tests on 6-in. cylinders were made as the work progressed, using Bear brand Portland cement, Gem Lake sand, and crushed rock, in the proportions 1:2:4, and averaged about 900 lb. per sq. in. for crushing at the age of 14 days.

A 1:2:4 mix was adopted for the arches and struts, and a 1:2½:5 mix for the buttresses. The actual proportions, however, were sometimes changed, but 1¼ bbl. of cement for the arches, and 1½ bbl. for the buttresses were used always. The rock was crushed in a gyratory crusher, and separated into three sizes through a revolving screen having 1½, ¾, and ¼ in. meshes. The rejects from the screen went into a jaw crusher, the jaws of which were set to give a maximum size of 2 in.

The distribution of the concrete to the different arches and buttresses was done with two-wheeled push carts and short chutes.

During the construction period, in the summers of 1915 and 1916, tension tests were made of cement briquettes in a small field laboratory.

Much attention was also paid to the sand used, and 1:2 and 1:3 mortar briquettes were tested frequently; silt analyses were made as the work progressed.

The reinforcement placed in the dam consisted of high-carbon steel bars, either corrugated or twisted. As the position and details of these bars are fully shown in the figures, no further explanation need be given.

The trees standing on the reservoir site were cut down, sawn into lumber in a mill erected on the ground by the contractors, and used for the forms. Large cone-bearing trees can be found in this neighbourhood up to elevation 11,000 in fairly large quantities, but not of the best quality. The lumber proved to be good enough for form work, was used green, and on that account ¾ by 4 in. battens were placed on the under side of the sloping arch to avoid the leakage of grout between the boards when

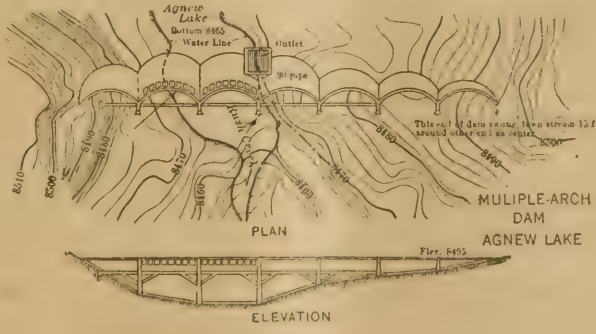
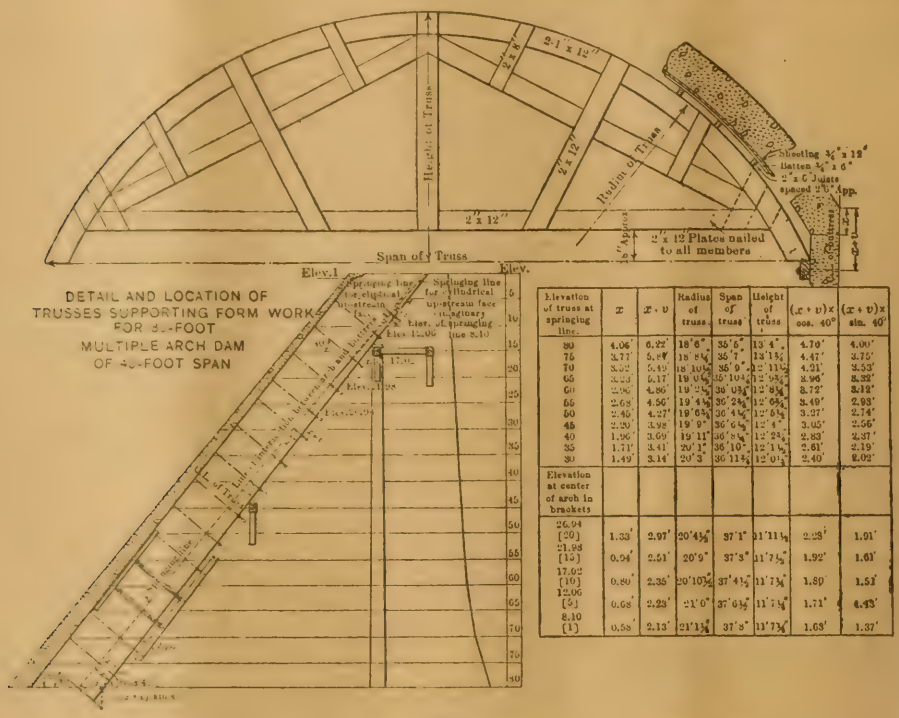


FIG. 8.

shrinkage took place. These battens also helped to give an even, circular shape to the outer ¾ by 12 in. boards, constituting the form for the down-stream face. This sheeting was supported on 2 by 6 in. studs, 2 ft. 6 in. apart, toe-nailed to the wooden arch trusses shown in Figs. 3 and 9. These trusses were 5 ft. apart in elevation, and a little more than 6¼ ft. apart, measured along the arch slope. The form work for the up-stream face consisted also of ¾ by 12-in. boards nailed to 2-in. by 6-in. studs, which in turn were nailed to circular boards at regular intervals. This outside form was held away from the inside from (down-stream side) by wooden distance pieces of the proper length, which pieces were re-

moved just before the concrete reached them. A 1:2 plaster coat of cement mortar $\frac{1}{4}$ in. thick at the crest, and increasing to $\frac{3}{4}$ in. thick 80 ft. below, was put on the up-stream face with a cement gun.

At the south abutment the last two arches are provided with spillway openings. These spillway openings can be closed with loose flash-boards. This it is proposed to do toward the end of the wet season, so as to fill the reservoir to within, say, 1 ft. of the crest of the dam, thereby gaining 2 ft. of water over an area of nearly 200 acres. The spillway is shown in detail on Fig. 10.



Elevation of truss at springing line.	x	$x \cdot v$	Radius of truss.	Span of truss.	Height of truss	$(x \cdot v) \times$ cos. 40°	$(x \cdot v) \times$ sin. 40°
80	4.06′	6.22′	18′6″	35′6″	13′4″	4.70′	4.00′
75	3.77′	5.89′	18′8¼″	35′7″	13′1½″	4.47′	3.75′
70	3.52′	5.49′	18′10¾″	35′9″	12′11½″	4.21′	3.53′
65	3.23′	5.17′	19′0½″	35′10¼″	12′9¾″	3.96′	3.32′
60	2.96′	4.86′	19′2½″	36′0⅜″	12′8¾″	3.72′	3.12′
55	2.68′	4.56′	19′4¾″	36′2⅝″	12′6¾″	3.49′	2.93′
50	2.45′	4.27′	19′6¾″	36′4⅝″	12′4½″	3.27′	2.74′
45	2.20′	3.98′	19′9″	36′6½″	12′4″	3.05′	2.56′
40	1.96′	3.69′	19′11″	36′8½″	12′2¼″	2.83′	2.37′
35	1.71′	3.41′	20′1″	36′10″	12′1½″	2.61′	2.19′
30	1.49′	3.14′	20′3″	36′11½″	12′0⅛″	2.40′	2.02′
Elevation at center of arch in brackets							
26.94 [20]	1.33′	2.97′	20′4½″	37′1″	11′11⅛″	2.23′	1.91′
21.98 [15]	0.94′	2.51′	20′9″	37′3″	11′7½″	1.92′	1.61′
17.02 [10]	0.80′	2.36′	20′10½″	37′4½″	11′7¾″	1.89′	1.51′
12.06 [5]	0.68′	2.23′	21′0″	37′6½″	11′7⅛″	1.71′	1.43′
8.10 [1]	0.58′	2.13′	21′1¾″	37′8″	11′7¾″	1.63′	1.37′

Fig 9.

The cost.

The Gem Lake Dam contains 8,537 cubic yards of concrete and 82 tons of reinforcing steel. The contract price was $22 [approximately £4 8s.] per cubic yard, including cement, forms, plastering the up-stream face, and all tools and materials except the reinforcing steel, which was paid for as an extra at the rate of $110 [approximately £22] per ton in place. The excavation, of which there was only a limited quantity, was also paid for as an extra. The high cost is explained by the fact that freight rates were high, and, further, that the distance from the railroad to the power-house site at Silver Lake, at the foot of the steep mountains, was nearly 60 miles over desert roads with heavy grades. From the power-house site, a tramway, approximately

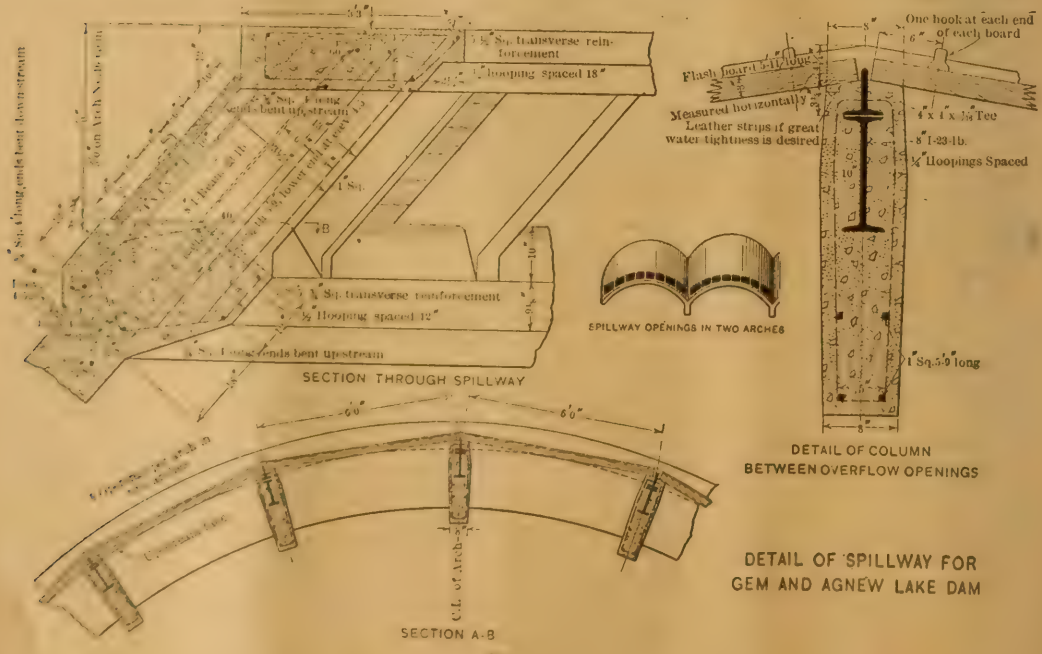

½" Sq. transverse reinforcement
Hooping spaced 18"
½" Sq. transverse reinforcement
½" Hooping spaced 12"
SECTION THROUGH SPILLWAY
EPILLWAY OPENINGS IN TWO ARCHES
One hook at each end of each board
Flash board 5-11"long
Measured horizontally
Leather strips if great water tightness is desired
4"x4"x⅜" Tee
8" I-23-lb.
¼" Hoopings Spaced
1"Sq.5'9"long
DETAIL OF COLUMN BETWEEN OVERFLOW OPENINGS
C.L. of Arch
SECTION A-B
DETAIL OF SPILLWAY FOR GEM AND AGNEW LAKE DAM

Fig. 10.

4,500 ft. long, took all supplies up the mountain side to Agnew Lake, 1,250 ft. above. At the outlet of this lake, the Agnew Dam, a smaller structure, 30 ft. high and 280 ft. long, similar in design to the Gem Lake Dam, but having only one strut, was built at the same time and at the same unit prices, in order to increase the capacity of the natural lake. All material for use in the construction of the Gem Lake Dam was brought across this lake on a barge, for a distance of about 2,000 ft., to the foot of another tramway terminating at the site of the Gem Lake Dam, 550 ft. higher in elevation. The cost of these tramways was not included in the price per cubic yard for concrete, but was paid for as an extra. These tramways were also necessary for the construction of the pressure pipes to the power-house, one from Gem Lake, and one from Agnew Lake, and would have had to be built independent of the dams.

A rock fill dam on the same site would have had to be built for $2.15 per cubic yard (construction cost), including the water-tight face and hand-laid rock, in order to be on equal terms, as to cost, with the multiple-arch dam built. In the writer's opinion, this would not have been possible in this place. In any locality where cement can be laid down at less cost than in this case, the relative cost of a multiple-arch dam and a rock fill dam will be still more in favour of the multiple-arch dam.

The writer furnished the designs and also supervised the construction of the dams.

Mr. C. O. Poole was chief engineer for the whole development; E. J. Waugh, ASSOC.M.AM.SOC.C.E., was resident engineer; L. B. Curtis, M.A.M.SOC.C.E., field engineer; and Mr. F. O. Dolson, superintendent of construction. Messrs. Duncanson Harrelson Company, of San Francisco, were the contractors for both dams.

NOTES FROM IRELAND.

SPECIALLY CONTRIBUTED BY AN IRISH CORRESPONDENT.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Irish Notes," 24 Bride-lane, Fleet-street, E.C. 4.]

Future Housing Needs.

It is to be hoped that the National Housing and Town Planning Council will endeavour to extend their operations to Ireland. Although much has been done in Ireland in recent years to provide improved dwellings for the labouring classes, there is a vast amount still to be done in this respect, particularly in the towns and villages. It seems probable that, with a fixed minimum price for corn, there will be a permanent increase in the land under tillage, that the flow of emigration from the country will be checked, and that presently there will be a gradual increase in the population, with an imperative demand for improved housing accommodation, both in the towns and rural districts. It is therefore of the utmost importance that every effort should be made in Ireland to promote the aims of the National Housing and Town Planning Council, which are, in brief—(1) That the most suitable designs and plans shall be prepared for house building schemes. (2) The standardisation of component parts, and the organisation of building activity, so that the full economies of production on a large scale may be secured.

* * * *

Would it not be well if the architectural and other associations in Ireland dealing with housing problems and cognate subjects joined hands with the National Housing and Town Planning Council, and proceeded at once to work on the same lines in conjunction with that body? If this could not be arranged, however, the writer again suggests the promotion of a national congress towards the end of the war by county and municipal authorities, as well as by the several engineering and architectural associations of the country. This congress could consider the needs of the country in respect of better housing and the public health generally, road construction, water supply, sanitation, river drainage, land reclamation, &c. At a congress of the sort, consisting of public and professional men, resolutions could be framed embodying the views of the members, and committees could be nominated of men versed in particular branches of the subjects dealt with at the congress; these committees would then further study the problems entrusted to them and draft reports for the study and consideration of future congresses.

* * * *

In this way much useful work could be done from year to year, and instead of spasmodic efforts being made at intervals to deal with housing and similar problems affecting the public health, and the advancement of the country in other respects, there would be committees of experts who would have these matters constantly under consideration. At each congress the members could decide regarding the best steps to be taken to carry out the works and reforms advocated by their committees. In many cases it would no doubt be necessary to invoke the assistance of Government in carrying out schemes, and the best way to obtain such assistance would be first to draft well-considered schemes for forwarding particular works, and then to have these schemes laid before the proper Government authority by a deputation from the congress of well-known public men and professional experts. In this way, by continuous efforts and by the careful study of special problems, much progress might be made from year to year, and many disheartening conditions and problems which it now seems hopeless to tackle might by a gradual process and the force of public opinion be ultimately solved and dealt with.

* * * *

Assistant County Surveyors.

In many counties in Ireland the assistant county surveyors have not yet reached the position to which, considering the duties they have to perform, they are fairly entitled. Under the Grand Jury Act, which was superseded by the Local Government Act in 1899, the maximum salary which could be paid to an assistant county surveyor was £80 a year, but at that time an assistant surveyor usually only devoted a portion of his time to his county duties, which consisted chiefly in making a quarterly inspection of the roads in his district and in measuring the stone put out by the contractors in the autumn. Under the Local Government Act, however, many important changes in the management of the roads have been effected; the great majority of county councils now own their steam-rolling plant, stone-breakers, and other machinery, while the contract system has been replaced by direct labour on the roads in several counties. As a consequence, the duties and responsibilities of assistant county surveyors have more than doubled in many instances. This entails their devoting the whole of their time to county work, and one might assume that their salaries should, in such cases, be doubled; but recent returns show that in very few cases does the salary exceed £150, and that it usually ranges between £100 and £130. This is hardly sufficient for a man to live on and to present a respectable appearance at the present time, and it is not the salary which a capable man is entitled to for the performance of the duties attaching to the office of assistant county surveyor in those counties in which a scheme of direct labour is in operation.

* * * *

If a system of road maintenance by direct labour is to be a success in an Irish county the assistant surveyors must be men of strong character, energetic, and of good business habits; they must have a thorough knowledge of their work; they must be up early and out late, and they must be fully capable of directing and controlling the men under them. Men of this class deserve the recognition and appreciation of their councils, and this can best be shown by the payment of fair salaries to them for their services. It is an all-round advantage to have capable and contented assistant county surveyors devoting all their time to county work. It relieves the county surveyor of much trouble and anxiety, while at the same time county councils can feel that they are acting in the best interests of the ratepayers by having men on whom they can depend to see that the work of the county is carried out in an efficient and economical manner. The writer suggests that a commencing salary of £150 a year, rising by annual increments to £200, with an allowance of £50 a year to cover travelling expenses, would not be more than reasonable remuneration for the duties which assistant surveyors have now to perform in most counties.

PETROL SUPPLIES.

THE ALLOWANCE TO MUNICIPAL ENGINEERS.

In the House of Commons on Tuesday, Sir Howell Davies asked the President of the Board of Trade if the restrictions enforced on the use of petrol would be relaxed in favour of borough engineers and surveyors who, in consequence of their depleted staffs, could not supervise the areas under their jurisdiction except by motor cars requiring a larger supply of petrol than ten gallons each per month.

Mr. Roberts: The present situation as to the supplies of petrol is not satisfactory, and, in view of the requirements for military purposes, consumption for civilian needs must be reduced. In these circumstances, the Petrol Control Committee regret that they are unable to increase the allowance of ten gallons of petrol per month made to borough engineers and surveyors using motor cars in connection with their professional duties.

Sir H. Davies: Are we to assume that men holding responsible positions in the oversight of large county boroughs are to be treated in the same way as ordinary civilians?

Mr. Roberts: My hon. friend is not entitled to assume that. The whole question is one of available supplies, and we are restricting—in fact, prohibiting the use for private purposes.

CINERIS: A PLEA FOR SANITARY REFORM.

By Albert C. Freeman,

Author "Crematoria in Great Britain and Abroad."

A deputation of undertakers from London and the provinces recently waited on Mr. Neville Chamberlain in order to bring before him the difficulties experienced in the making of coffins and the digging of graves. According to reports, bodies have been lying for days awaiting burial owing to the shortage of gravediggers.

Now, then, is the time for sanitary reform in this direction. We adopt every measure within our power to safeguard the health of the community and provide against pestilence and disease. We provide isolation hospitals to prevent the spread of infection; refuse destructors to destroy that which—if allowed to accumulate—would become a menace to health. We dispose of our sewage on the most scientific principles, and adopt measures for the inspection of milk and other foods to safeguard the health of infants, yet we neglect one of the most important details affecting the public health. We pile up our dead, year by year, in the ground within our most thickly-populated districts. It matters not to us what becomes of our bodies after death, but it matters much to those who live after us. Those who have lived clean lives would not wish to leave behind them that which is an injury to those who live after them.

There is news every day from graveyards that there is not a gravedigger left for the work. The dead cannot be buried, so the public turn—most gingerly—towards the question of cremation. They think—then hesitate; the idea of burning does not appeal to them. Why? Because they have not been educated on matters of sanitation. An infinity of conventional, social, and religious feeling is dead against it. All these things amount to little better than "superstition, stupidity, and slavery to the wrong kind of imagination." At the present moment cremation is most unpopular in this country. And why? It is [illegible] the public have not realised that cremation does in sixty minutes what inhumation takes six hundred years to perform.

Let the pious man and woman realise the simple fact that cremation implies no less perfect a faith in the immortality of the soul and its celestial destiny than its far more dreadful committal of the body to the earth with all its dangers to the living.

It is generally found that those who uphold the [illegible] to burial in the earth are most ignorant of the method of cremation. They are equally ignorant of what transpires in the earth. With earth burial it means the storing up of bacilli, [illegible] sources of infection for future use. Science has not proved that these germs will be destroyed in the earth, their power of evil in the earth absolutely unimpaired. Cremation, on the other hand, absolutely destroys all that remains of man—ashes to ashes in the fullest sense of the term.

Might not one of the duties of the proposed Ministry of Health be to superintend the disposal of our dead and see that they are decently disposed of—not left to corrupt our land and leave pestilence and disease behind them.

Old customs die hard we will agree, yet are we not becoming so inured to the rules of a country governed to meet the requirements of war that we should soon get accustomed to a new sanitary rule which demanded the cremation of the dead? If there were no gravediggers, then we should be compelled to accept the inevitable, and agree to the dead being decently cremated.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Will not Mr. Hugh P. Raikes, the newly appointed Chief Agricultural Commissioner for England and Wales, find his task somewhat difficult when he comes in contact with the average farmer of this country? Will he not discover that a large number of them are imbued with old-fashioned ideas about farming, and will decline to listen to his "new-fangled notions" as to what should be done to get the most out of the land? Are not many of our farmers without sufficient capital to purchase, or hire, the necessary labour-saving machinery or to rent a sufficient area of land to get the best results from it? Is it a fact that in Canada, where the area of a "field" is immense, the labour of two men is all that is required to produce enough wheat to feed 1,000 of their fellow men, because all the ploughing, sowing, reaping and threshing is done by the most up-to-date machinery manipulated with brains?

* * * *

Was there not a most interesting and appreciative article in the *Leicester Pioneer* of April 20th on the borough surveyor of that town, Mr. E. George Mawbey, M.INST.C.E.? Are not all of us who know that excellent engineer and good comrade delighted that his services should receive such a well-deserved tribute? Is it not refreshing to find that sometimes such public services receive public recognition, and that the carping criticism of some councillors and ratepayers of their public officials, which is so common in some districts, is not generally followed in every district? Do we not all wish Mr. Mawbey long life and health to carry on his useful work at Leicester?

* * * *

Was it not exceedingly patriotic and reasonable of the council of the Institution of Municipal and County Engineers to pass a resolution that they would not deal with the question as to the present methods of voting for associate members as members of the council until after the war is over? Is it not to be hoped that the agitation which has now been going on for some years on this question will be allowed to stand over until the 500 members and associate members who have joined the Colours, in various capacities have a chance of recording their opinions and votes on this highly controversial question?

* * * *

Is it not interesting to read that the Birmingham Electric Supply Committee have decided to release more men for the Army from their electricity power stations and employ women in the switch-rooms, engine-rooms, and in fact in every department of the stations for which women are suitable? Is it not extraordinary that the war has taught us that there are still open a large number of fields in which female labour can be successfully employed? Shall we live to see women borough surveyors and town clerks?

* * * *

Will not surveyors throughout the country be well satisfied with the selection of the men who compose the new committee charged with the responsibility for the control of the road stone quarries in the United Kingdom? Has there not lately arisen considerable difficulty, in some quarters, in obtaining the necessary qualities and quantities of broken stone for road maintenance, but is it not to be hoped that the committee will be able to remedy this trouble? Are there not a number of problems connected with the supply of road metal looming in the future, and are not the men who constitute the new committee admirably fitted to grapple with these as they arise?

CORRESPONDENCE.

Εἷς ἀνὴρ ὃν πάνθ' ὁρᾷ

LIGHT RAILWAYS.

To the Editor of THE SURVEYOR.

SIR,—Sir Ashton Lister, in his letter in THE SURVEYOR of last week, very properly draws attention to the fact that communication between large centres and country districts must be encouraged, and suggests that the construction of light railways will solve the problem. I quite agree with him, but there are endless difficulties in the way, especially with regard to the acquisition of land for the purpose. It is well known that our railways have cost more than double what they ought to have done by reason of the enormous sums paid for the land, and the costly litigation which preceded the construction of the lines. The Parliamentary Committee procedure is so costly that companies dread the expense involved in getting a Bill through Parliament. The presence of tramways in our streets and roads, to which so many people are beginning to object, is also a drawback to any extension of such a system, and if the proposed light railways are built at the sides of the roads, the difficulties connected with severance of frontage would be very great. The rigid character of a tram-car, running on rails, is a drawback, as it has no elasticity, or lateral play, to avoid other traffic, and a slight obstruction on the rails throws the whole system out of gear. Now that we have the self-propelled vehicle, and our ordinary roads are beginning to be constructed in a manner which is likely to meet all the traffic to which they will hereafter be subjected, would it not be better to direct all our attention and energies to the improvement of these roads, and to greater facilities for self-propelled traffic, rather than build obstructive light railways all over the country, which might, at no distant date, have to be taken up and scrapped, because they have become an intolerable nuisance?—Yours, &c.,

FLEXIBILITY.

May 8, 1907.

DECIMAL CURRENCY.

To the Editor of THE SURVEYOR.

SIR,—Comments being invited regarding the proposal in your correspondence columns of May 4th, I regret to have to point out that it differs in theory very little, and in practice not at all, from the proposal made by the Decimal Association for decimalising the British currency.

Your correspondent's new penny, ten to a shilling, is the 5-cent. piece, which I have shown in your columns must become, in any case, the new penny. Your correspondent suggests the lowest coin be a halfpenny, which bears out the non-decimalist contention that a cent. (hundredth part) is too inconvenient a coin for general use. See the New York *Engineering Record* of June 10, 1911, on "The Curse of the Nickel." It is shown that American 5 and 10 cent pieces are the lowest practical business coins, and that the losses in small transactions are thereby excessive, to attain to a reasonable fractional subdivision. Had your correspondent proposed to subdivide the shilling into 100 parts, coining a halfpenny of five parts, he would have indicated the difficulty, with a similar solution, accurately.

E. A. W. PHILLIPS, M.INST.C.E.

Hove,
May 7, 1917.

ENGINEERS AND FOREIGN LANGUAGES.

To the Editor of THE SURVEYOR.

SIR,—I have read with pleasure, in your issues of April 13th and 20th, your articles on "Engineers and Foreign Languages," and their reference to the auxiliary language, Esperanto, in which I have been more than interested for the past few years.

To study any "live" language outside one's own mother tongue, and to become proficient in it, takes a considerable amount of time, and, properly speaking, one should reside in the country in which the language is used for at least nine months. This is not always convenient.

No intelligent individual, after a moment's consideration, would think that any one national tongue should be used as a common one for all countries, for that would give one country a far greater advantage over other countries, thus tending towards injustice from the very start.

As one does not lose one's national individuality by learning one's mother tongue, so by studying a recognised auxiliary language like Esperanto, everyone will be helping towards the sealing of that bond of friendship which should exist among individuals and nations of the universe.

Esperanto has proved itself to be no myth, as is showed by the fact that nine international congresses have been held in the principal towns of Europe and America, where the proceedings have been conducted entirely in Esperanto, and where everyone has been able to understand every one else.—Yours, &c.,

RICHARD HOLDER.

Charlton, S.E. 7,
May 2, 1917.

To the Editor of THE SURVEYOR.

SIR,—I heartily endorse your remarks to the effect that it is a waste of time learning foreign languages when a simple auxiliary language, such as Esperanto, is available. The letter of "A Retired C.E." illustrates very clearly the advantages of Esperanto, which I have proved to be very suitable for technical purposes, having used it in engineering work. I had no difficulty in corresponding or in discussing technical subjects, although in this case I am self-taught, and have not had much practice in speaking the language.

The influence of your valuable paper, however, will doubtless help in removing the silly prejudice some people have against it. The less the knowledge the greater the opposition.—Yours, &c.,

A. E. WOODHOUSE.

Sanctuary House, Westminster, S.W.,
May 5th, 1917.

THE IMPORTANCE OF SEWAGE DISPOSAL.

MR. WATSON'S WARNING AGAINST MAKESHIFT SCHEMES.

Mr. John D. Watson, M.INST.C.E., engineer to the Birmingham, Tame, and Rea District Drainage Board, who, with Mr. A. J. Martin, M.INST.C.E., of Westminster, was called upon in 1914 to assist with his advice in dealing with the sewage of and securing a satisfactory water supply for Chicago, makes some interesting observations on these questions in a letter which he recently had occasion to write to Mr. Henry H. Walker, of that city.

"It is no news to tell you," he says, "that the London system of purification is somewhat similar to the Glasgow system, and, bar the use of chemicals, somewhat similar to that we recommended for Chicago. I think that the London experience might very well influence you in Chicago. They started first with a sewerage system fairly perfect so far as it went. By and by extensions and improvements were made which had a direct relationship to the original scheme, and all aimed at one goal. It would be wrong to say that that goal has been finally reached, but such work as has been done has been so well done and so consistently prosecuted by one engineer after another (who, to their credit, have subordinated their particular views in order to carry out the complete system laid down by the comprehensive plan which forms the goal above referred to) that the outsider and onlooker has nothing but praise to associate with the work.

"I may be biased, but I feel that sewerage and sewage disposal questions should bulk more prominently in a city's welfare programme than is usual. The great cost of such schemes contributes to the aversion in which they are held, but no self-respecting city can thrive permanently without having both a good water supply and a good sewerage system as the foundation of public health. Any makeshift schemes only lead to trouble and expense, without contributing to the satisfaction which results from a good thing well done. A thousand times better execute from time to time even the minimum of instalments of a well-designed whole than patch up a scheme which can never rank with the best of its kind. Chicago is no mean city, and it cannot afford to continue indefinitely to pour its filth into what is virtually an open sewer, more particularly when that 'open sewer' might be a charming stream of the finest water in the world."

FOOD WASTE.

NEW POWERS FOR LOCAL AUTHORITIES.

Answering a question in the House of Commons on Monday, Captain Bathurst said it was already a summary offence against the Defence of the Realm Regulations to waste any wheat, rye, or rice, or any products of these cereals; no similar provision had hitherto been made in respect of other commodities, although in the case of certain other cereals restrictions had been placed upon their use except as food. The nation could no longer afford the waste or wanton destruction of food of any description and it was proposed to issue without delay an Order of general application which would make the waste of any kind of food a punishable offence. The Local Government Board would confer upon local authorities and such of their officers as they might designate for the purpose the power and duty of enforcing within their districts the Orders in which these provisions occurred.

Mr. Rowlands: Will that be distributed among all the local authorities throughout the country?

Captain Bathurst: Yes; it will apply to every kind of wasteful food and to all the local authorities concerned.

L.C.B. AND THE FEEDING OF HORSES.

In a circular to town and urban and rural district councils the Secretary of the Local Government Board states that Lord Rhondda has received a communication from the chairman of a committee appointed by the Board of Trade to deal with the question of the utilisation and feeding of horses throughout the country. The present condition of our grain supplies, it is pointed out, makes it necessary that there should be an immediate reduction in the consumption of grain by animals.

The letter refers especially to the heavy dray or cart horse such as is employed, among others, by many local authorities. Horses of this character, the nature of whose work only requires them to move at walking pace with frequent intervals of standing, do not need the same amount of grain food as horses engaged in trotting work and covering a considerable mileage per day.

Lord Rhondda accordingly desires to urge the strictest economy by local authorities in the feeding of their horses. The committee inform him that for heavy cart horses the following is regarded as an amply sufficient ration:—

32 lb. per day of mixture composed as to one-half of grain and one-half of hay or oat-straw chaff. The use of oats in the grain moiety should be reduced to a minimum, their place being taken by maize and beans in the proportions of four parts maize to one part beans.

The committee add that the keeping at the present time of any horses in excess of the number actually required for the work to be performed is to be deprecated as involving an unnecessary consumption of grain. The Army authorities will be prepared to purchase any suitable horses that local authorities may find themselves able on inquiry to dispense with and so reduce the number of Army horses now being imported from abroad. Particulars of any such horses that can be spared should be sent to the Secretary of the Committee at Gwydyr House, Whitehall, London, S.W. 1.

Waste Fat from Military Camps.—Replying in the House of Commons on Tuesday to a question as to waste fats at military camps was made use of, the Financial Secretary to the War Office, Mr. Forster, stated that as a result of efforts extending over a considerable period sufficient material was now collected and treated to provide propellant for 1,000,000 lbs. pounds daily capacity.

Commandeered Municipal Horses.—At the meeting of the [illegible] Urban District Council on [illegible] it was stated that the military had visited the council's stables and had taken two of the horses, paying a little more than the council had given for them. The council's foreman replaced the horses at less money than they received for the animals taken. It was further stated that a councillor connected with the military [illegible] a town, but not the country, while the council could go into the country and not [illegible] the military wanted.

ELECTRIC VEHICLES IN THE FAR EAST.*

By T. H. C. Aldridge, M.Inst.C.E., M.I.Mech.E., Engineer-in-Chief and Manager, Shanghai Electricity Department.

Electric vehicles were introduced into Shanghai for the first time last year. The Electricity Department purchased three Milburn light cars, and one Waverley, also a 2-ton General Vehicle Company and a 700-lb. Milburn truck. These have all proved so satisfactory that two more trucks, one of 2-tons and the other of 1-ton carrying capacity, have been ordered from the General Vehicle Co.

Careful monthly records are kept of the operating costs of both the cars and the trucks, which show that the former effect a saving of about 9 per cent per annum over cheap petrol-driven cars, including capital and running costs all in, on a basis of twenty-five miles run per day. With a daily mileage of fifty miles the saving is in the neighbourhood of 30 per cent.

In addition to the electric cars used by the Department there were also three privately-owned ones on the road, and I am given to understand that they have also given satisfaction to their owners. There are several more now on order for private use, and there is little doubt that in a few years electries will form no inconsiderable proportion of the total cars in Shanghai.

The department is making arrangements to hire out small motor-generator charging sets for the use of individual owners, the charging sets being installed in their garages. A more general use of electric cars and trucks should lead to a further profitable line of business for the Department, as, although the sale of electricity for charging purposes is unlikely to run into such large figures as in power supply, all units sold at "off peak" times are profitable, and any means which may tend to obtain this end ought to be cultivated.

CONTROL OF ROAD STONE QUARRIES.

APPOINTMENT OF SPECIAL COMMITTEE.

An Order was made by the Minister of Munitions on Wednesday taking possession of the road stone quarries in the United Kingdom, under the Defence of the Realm Regulations, and we are officially informed that responsibility for the control of the quarries has been assigned to a Special Committee, as follows:—

Lieut.-Col. A. St. John Cooke, D.S.O. (chairman).
Mr. J. S. Killick, A.M.Inst.C.E., county surveyor of Herts (vice-chairman).
Mr. P. Dodd, M.Inst.C.E., borough engineer of Wandsworth.
Capt. J. F. Hawkins, R.E., county surveyor of Berkshire.
Mr. W. Jervis, M.Inst.M. and C.E., county surveyor of East Suffolk.
Mr. H. H. Law, M.Inst.C.E., chief engineering inspector to the Local Government Board.
Lieut.-Col. A. S. Redman, R.E.
Mr. H. E. Stilgoe, M.Inst.C.E., city engineer of Birmingham.
Mr. W. J. Taylor, M.Inst.C.E., county surveyor of Hants.
Mr. J. B. Harvey (secretary *pro tem.*).

Road stone quarry owners are instructed to carry on their present operations till June 15th next, or till such earlier date by which they may have received any special instructions from the committee.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

LOANS SANCTIONED.

Aberdeen T.C.—£40,000 for the electricity undertaking.

Cumberland C.C.—£9,300 for roads in the Longtown area.

St. Pancras B.C.—£13,000 for electricity purposes.

Battersea B.C.—£1,000 for electricity purposes.

FORTHCOMING INQUIRIES.

MAY.	£
15.—**Scarborough.** For constructional, drainage, and road works (Mr. P. M. Crosthwaite)	12,774
16.—**Middlesbrough.** For street improvement works (Mr. P. M. Crosthwaite)	12,850

Extract from Report for 1916.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Hexham R.D.C.—The council have referred to the Hospital Committee a letter from the Local Government Board suggesting that they should submit their proposals for the erection of an administrative block at the proposed hospital as soon as practicable, so that the work might be expedited when the present restrictions on borrowing are withdrawn.

Newcastle-on-Tyne T.C.—The Sanitary Committee are taking steps to obtain the site of the old infirmary for the purpose of public abattoirs.

Northumberland C.C.—The Education Committee have been authorised to carry out repairs to the Berwick Grammar School, at an estimated cost of £100.

HOUSING AND TOWN PLANNING.

Barrow T.C.—It has been decided to enter into an agreement with the Ministry of Munitions for that authority to build 250 houses for munition workers at Vickerstown, Walney Island. The property will be managed by the corporation, who at the end of five years will take over the houses at a fair valuation.

Monmouthshire C.C.—The clerk has received instructions to communicate with the various urban and rural councils asking them to supply particulars of housing schemes they propose to carry out after the war.

MOTOR TRANSPORT.

Aldershot U.D.C.—The Finance Committee have been asked to report on the question of purchasing a motor fire engine.

Auckland R.D.C.—The council have authorised a committee to purchase a metal haulage wagon in the event of such a vehicle being offered for sale.

Barnstaple R.D.C.—The council are considering the purchase of a steam lorry.

Clayton-le-Moors U.D.C.—The council are inviting tenders for a motor mowing-machine.

Hampstead B.C.—It has been agreed to purchase two 1-ton electric vehicles for disinfection work. The cost will be about £1,600.

Huddersfield T.C.—The 2-ton Guy chassis supplied by Guy Motors, Limited, of Fallings Park, Wolverhampton, for the gas department, is so constructed as to enable the tipping body of the wagon to be divided into two compartments of 1 ton each, the object being to minimise labour in delivering coke in bulk to customers.

Hull T.C.—The Parks and Burial Committee have agreed to purchase a motor lawn mower.

Marylebone B.C.—The borough council have received two of the six Austin vehicles which have been ordered for refuse collection.

Shoreditch B.C.—For the purpose of the cartage of clinker and coal it has been decided to purchase a second-hand 5-ton Foden steam wagon and two 4-ton trailers. It is estimated that by this means a saving of nearly £500 a year will be effected in the disposal of clinker.

REFUSE COLLECTION AND DISPOSAL.

Beckenham U.D.C.—The Commanding Officer of the local troops has agreed to allow four of his men to attend daily at the municipal depot for the purpose of assisting in sorting and packing the waste paper.

Bournemouth T.C.—The borough engineer, Mr. F. P. Dolamore, reports that for the past five years paper collected has been separated at the destructor and baled in a press for use, and that bags are supplied free to ratepayers, these being collected when filled. The collection has not, however, resulted in a very large return as most producers sold direct. Newspapers are being collected and sold for the benefit of the Prince of Wales' Fund. Tins are separated from other refuse and sold in a similar way to the paper. The receipts on account of paper, newspapers and tins for the year 1916 amounted in all to £151.

Haworth U.D.C.—The council have appointed a sub-committee to consider the collection of refuse, with a view to the material being profitably disposed of.

ROADS AND MATERIALS.

Barnstaple R.D.C.—The council have passed a resolution asking that tar-spraying of the main roads by the county council should be carried out at once, and not left, as last year, until September.

Battersea B.C.—It has been decided to carry out improvements in Ascalon-street and Savona-street, at an estimated cost of £1,077.

Belfast R.D.C.—The county surveyor, Mr. D. Megaw, in his report on the state of the roads in the rural district, stated that tenders had been accepted for almost all of the authorised supplies for the present year, but on account of advances in prices the tonnage which it was possible to call for had in many cases to be reduced. The quantities for a number of years had been gradually reduced until at present the total tonnage estimated for the district in the present year stood at 9,805 tons, whilst for the three years ended March, 1912, the annual consumption was over 17,000 tons. Unless the volume of traffic diminished, a considerable increase in the estimate for stones must be looked for at no distant date. The county surveyor explained that the cause of the reduction in the quantity of stones used this year was that the council had reached the limit of their expenditure. The average cost in 1912 was between 3s. and 3s. 6d., while it was now between 4s. 6d. and 5s. A resolution was adopted requesting the county council to expend as a temporary measure the sum of £1,000 over the statutory limit, and to obtain the Local Government Board's sanction thereto.

Camelford R.D.C.—The Road Board have made a grant of £750 towards repairing the Otterman Station-road which has been damaged by hauling that has been proceeding in connection with a prisoners-of-war camp.

Crook U.D.C.—It was reported that the scavenging work done by the council showed a marked improvement as compared with the work done in some cases by private persons under contract.

Cumberland C.C.—A scheme has been approved of road construction in the Longtown district on the terms arranged with the Road Board. The cost will be met by a loan of £9,300, which has been sanctioned by the Local Government Board. The Road Board grant for tar-macadam and surface-tarring work on the main roads has been provisionally fixed at £2,000.

Inverness-shire C.C.—The county council have forwarded to the Road Board an application from the Skye District Committee for a grant of £21,240 for the repair of the main roads from Portree to Dunvegan.

Lancs C.C.—It is announced that the Road Board have made a grant of £10,000 in aid of the cost of tar-spraying and tar-macadamising main roads.

Londonderry C.C.—In reply to an application of the county council, the Local Government Board wrote that it appeared the original limits of expenditure in the rural districts were insufficient. In the circumstances the board felt that the most satisfactory course to adopt was to fix permanent new limits in each case as follows: Coleraine, £9,500; Limavady, £10,000; Londonderry, No. 1, £8,500; Magherafelt, £10,000. The county council approved of the new limits.

Marsden U.D.C.—At a meeting of the Highways Committee a letter from the county surveyor was read suggesting the pooling of labour for the repair of main roads. The consensus of opinion was that the repairing staffs of neighbouring local councils were so much depleted that the suggestion was scarcely practicable, but the council's surveyor, Mr. F. Greenwood, was instructed to discuss the matter with the Saddleworth surveyor.

Swansea T.C.—The Highways Committee reported the receipt of two tenders for private street works, one from Birmingham at £85, and the other from a Swansea firm at £136. The lower tender was accepted.

Twickenham U.D.C.—The county surveyor wrote approving the urban district council's proposals with

respect to tar-painting, and stating that, in the event of difficulty being experienced in obtaining the necessary granite chippings required for the work, the County and Highways Committee would be prepared to sanction the use of clean pea gravel or fine hoggin.

Westhampnett R.D.C.—In order to comply with the instructions issued by the officer in charge of roads and communications in the Southern Command, the main arterial roads of the rural district are to be first treated with tar, the work to commence at the earliest possible date.

Woolwich B.C. The Road Board have approved the estimate of the borough engineer, Mr. J. Sutcliffe, at £1,572, for making up the portion of Westmount-road and Grangehill-road, Eltham, for motor-omnibus traffic.—The borough council have referred to the General Purposes Committee the question of concluding an arrangement with the London County Council with respect to the proposal to double the tramway lines in Plumstead-road, near Parry-place.

SEWERAGE AND SEWAGE DISPOSAL.

Barnet U.D.C.—It was stated that as the surveyor, Mr. W. B. Chancellor, was on active service it would not be possible to go into the sewerage scheme for Totteridge at present.

Walsall R.D.C.—The surveyor, Mr. W. Young, has been instructed to submit amended estimates for the Rushall sewage disposal scheme, sanction for which has been obtained by the rural district council.

Whitchurch U.D.C.—The surveyor, Mr. M. W. Sowden, has prepared an estimate for an improved sewerage scheme. The work, which will cost about £500, will not be put in hand till after the war.

WATER, GAS, AND ELECTRICITY.

Athlone U.D.C. The possibility of the water supply breaking down owing to defective machinery, at the works is engaging the attention of the council. The Local Government Board some time ago informed the council that any expenditure on work must be deferred till the end of the war.

Barrow T.C.—The Barrow-in-Furness Corporation Water Bill, which is for the purpose of taking a further quantity of water from the river Duddon, was passed by the Parliamentary Committee on Tuesday, and went forward for the third reading.

Camelford R.D.C.—The services of an engineer are to be engaged to prepare a water and drainage scheme for Churchtown, Limehead, Rowe, Higher Penquite, and Mount Pleasant.

Colchester T.C.—The town council have passed a resolution supporting the West Ham Town Council in urging upon the Board of Trade the importance of a cheap supply of electric power, and suggesting the increased representation of municipalities on the Committee appointed by the Board of Trade.

Dawlish U.D.C.—The surveyor, Mr. S. F. C. Churchward, has submitted alternative schemes for impounding an increased head of water at the Thorns waterworks, one of which consisted in placing a larger dam across the stream and goyle at the point of the present filter-bed, the other of placing a still larger dam at a point lower down the stream, entailing the erection of a new filter-bed. The surveyor has been instructed to prepare estimates of the cost of the alternative schemes, with an approximate estimate of the water that would be gained in each case.

Dover T.C. The deputy surveyor has been instructed to prepare a report on the cost of eliminating the lime from the water supply.

Middlesbrough T.C.—It has been agreed to reduce the price of gas to the ordinary meter consumers by 2d. per 1,000 ft., which now makes the nett charge 2s. per 1,000 ft. It has been also decided to increase the amount allowed to the slot meter consumers from 28 ft. to 30 ft. for one penny.

Newport (Mon.) T.C.—The Waterworks Committee recommended the town council to proceed with the new waterworks scheme at Penybont.

Stockton T.C.—The town council have agreed to an estimated expenditure of £299 on alterations to trunk gas mains.

MISCELLANEOUS.

Blackpool T.C. The Blackpool Improvement Bill which proposes, among other things, to carry out certain promenade works in order to protect the coast in the Bispham district—a precaution which was stated to be very urgent—came before the Parliamentary Committee on Tuesday. Evidence was given as to the necessity of the work, and it was stated that the sea-wall works already existing had withstood wind and waves most satisfactorily. Mr. J. S. Brodie, the engineer of the scheme, said the Blackpool Council believed in making their work solid and permanent as far as possible, and they believed they had succeeded in a remarkable manner. The preamble of the Bill was proved, and the Bill was passed for consideration.

Hornsey T.C.—It has been decided to purchase a magnetic separator for clinker at the sanitary depot.

SEWAGE DISPOSAL.

THE NORTH TORONTO BRUSHWOOD FILTERS.

By S. H. Adams, Assoc.M.Inst.C.E.,
Managing Director, Adams Hydraulics, Limited, York.

Referring to the articles in The Surveyor of January 5th and March 9th last, I am now advised from Toronto that the Municipal Board of Health have approved of these filters to such an extent as provisionally to allow a five-million gallon per acre rate. (It will be remembered that the filters have been running for nearly two years, taking sewage at the rate of seven million gallons per acre.) The board's decision will remove any lingering doubts as to the wisdom of using brushwood as a filtrant, and we have also a definite figure which provides for a very safe margin.

In view of the above, there can be no question that engineers who have sewage purification works in hand should very carefully consider the use of this material, which, whilst giving practically guaranteed results, effects such considerable economy in constructional cost. If Mr. Phelps' expectations prove correct we shall expect to hear in good time from him that a 7-ft. deep filter of this type, with the brushwood made up after the first settlement, is dealing with tank effluent at the rate of eight or nine million gallons per day per acre, and that his experiments with crude screened sewage are equally satisfactory.

It cannot be doubted that the tests carried out at North Toronto must have a most important bearing upon future methods of sewage disposal. By the simple change from clinker to brushwood as a filtrant, combined with the use of a suitable distributing apparatus, the volume put through a filter may be at least doubled. The Adams Patent Cresset Revolving Distributors used at Toronto were specially designed for the purpose. The difficulties due to the increased sizes of all the parts, with the additional weight of the liquid carried by the distributor, in conjunction with the loss of driving power consequent upon the proportionately small diameter, were all most satisfactorily overcome by the use of the air-lock seal with the result that the distributors absorbed a head of 12 in. only.

With regard to the question of the treatment of crude sewage upon such filters, it will be remembered that in the earlier Leeds experiments a filter 7 ft. deep converted screened sewage in ten minutes' transit into a non-putrescible effluent, and there can be no question that the large tanks used in this country have produced in many cases, if not a sterile, certainly a semi-sterile, tank effluent, robbing the filter of the life it needs. To the writer, who has been so closely associated with bacterial sewage purification since its inception, it is distinctly interesting to note how gradually the methods used are evolved one from another, and patched on, as it were, to one or another. But the outstanding facts are always the same—the need for more aerobic and less anaerobic treatment. The nitrification shown by analysis of the Toronto effluent is slight, but, after all, this is not essential, provided the effluent is stable, which it is; with the five million dose, no doubt the nitrification will be higher. The brushwood filter is really almost a reversal of the air-blown bacteria bed of the late Col. Waring in the States and of the late W. J. Corbett's (of Salford) air-blown roughing filter (which, with the removal of the clinker only, became an activated sludge tank). In the former an attempt was made to blow air successfully through the interstices of the filtering medium, in the latter air is carried successfully right through the filtering medium, with the results we have seen. Mr. Phelps' investigations and results will be of inestimable value, particularly after the war, owing to the arrears of work to be made up and the probable need for economy in expenditure.

Hackney Electricity Undertaking.—The Hackney Borough Council's electricity undertaking has been running at a considerable loss for some time, and in view of the improbability of working costs decreasing during the war the Electricity Committee recommend an all-round increase of charges, with an exception in favour of the slot meter scale.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CITY OF BIRMINGHAM.

Applications are invited from men ineligible for military service for the position of a Temporary Surveying Assistant in the Town Planning Department, at a salary of £3 3s. per week.

Applicants must have had previous experience in the work of surveying, levelling, and preparing plans, &c.

The appointment will be terminable by one calendar month's notice on either side. Applications, endorsed "Surveyor's Assistant," stating age, experience, present employment, reason why ineligible for military service, and what documentary or other evidence can be submitted in support thereof, and accompanied by copies of three recent testimonials, should reach me by Tuesday, 22nd May, 1917.

HENRY E. STILGOE, M.INST.C.E.,
City Engineer and Surveyor.

The Council House,
Birmingham. (3,412)

TILBURY URBAN DISTRICT COUNCIL.

(a) Tar-spray Contractors.
(b) Tar Distillers.
(c) Granite and Stone Merchants.
(d) Horse Dealers.
(e) Makers of Water Carts.
(f) Manufacturers of Toilet Paper.
(g) Public Works Contractors.
(h) Paving Contractors.

The above Council invite Tenders for (a) Tar-spraying military and other roads and paths within the Urban District; approximate area to be treated fifty thousand superficial yards. (b) The supply and delivery of ten thousand gallons (about) approved Refined Tar, complying with the Road Board's Specification. (c) The supply and delivery of Tarviated Granite, Tarred Ragstone, Chippings, Screened Gravel, &c., for roads and tar paving materials. (d) The supply of a heavy Shire-bred Horse, about 16½ hands. (e) The supply of a Two-wheeled Street-watering Cart for use with the steam roller. (f) The supply of Toilet Paper. (g) The supply and laying of about 600 feet lineal of 15 inches diameter Stoneware Pipes on a ferro-concrete raft foundation, together with the construction of manholes. (h) The supply and laying of about 70 superficial yards of Artificial Stone Flagging, or, alternatively, Blue-brick Paving, and works incidental thereto. Further particulars, copies of Specifications, and Forms of Tender may be obtained on application to Mr. S. A. Hill-Willis, ASSOC.M.INST.C.E.I., Engineer and Surveyor to the Council, at whose Office Plans of the Constructional Works mentioned above may also be inspected. Sealed Tenders must be delivered to the undersigned before 11 a.m. on (a), (b), (c) (d), (e), (f), Monday, 21st May, 1917; and (g), (h), Monday, 11th June, 1917.

(By order)
THO. A. CAPRON,
Clerk to the Council.

Council Offices,
Tilbury.
May 8, 1917. (3,411)

FAREHAM RURAL DISTRICT COUNCIL.

TENDERS FOR MACADAM.

Tenders are invited by the above Council for the Supply of Granite, Basalt, or other Hard Stone, required for the year ending March 31, 1918.

Form of Tender may be obtained on application from the undersigned.

Tenders, sealed and endorsed "Tenders for Macadam," to be delivered to me on or before May 31, 1917.

The Council do not bind themselves to accept the lowest or any Tender.

J. F. WHITEAR,
Surveyor.

16 Southampton-road,
Fareham, Hants, (3,413)

PERSONAL.

Mr. M. Bradley, surveyor to the Atley Urban District Council, has been granted a bonus of £15 a year.

Mr. C. W. Annis, inspector of nuisances to the Westhampnett Rural District Council, has been voted a war bonus of £10.

Mr. E. N. Keay, of the borough surveyor's department, Eastbourne, has received £5, and Mr. S. W. Richardson £7 15s., as a war bonus.

Mr. W. B. Madin, surveyor to the Rushden Urban District Council, has, we regret to state, suffered bereavement by the death of his wife.

Mr. E. Webley, assistant surveyor and sanitary inspector to the Southwick Urban District Council, has had his salary increased by £20 a year.

Mr. Ernest Kingdon, highway surveyor to the South Molton Rural District Council, has had his salary increased by £10 a year for the duration of the war.

Messrs. W. R. Temperley, J. P. Walton, and G. F. Surtees, surveyors to the Hexham Rural District Council, have received a war bonus of ten guineas each.

Mr. E. Witton Booth, ASSOC.M.INST.C.E., acting engineer to the Beddington and Wallington Urban District Council, has been called to the Bar at the Middle Temple.

Mr. J. H. Harris, borough surveyor of Penryn, has been granted permission to superintend the sanitary inspection work of East Kerrier, in place of Mr. Pearce, who is joining the colours.

Mr. G. Thompson, surveyor to the Easingwold Rural District Council, has had his salary increased from £150 to £160 a year, with, in addition, an allowance of £5 for travelling expenses.

Mr. F. G. Cornish, surveyor for the north district of the Tavistock Rural District Council, has been called up for military service, and the council have accepted the offer of Mr. W. H. Batten, surveyor of the south district, and Mr. T. H. Harris, sanitary inspector, to carry on the work in his absence.

Mr. J. W. Pike, surveyor to the Holsworthy Rural District Council, has been exempted till September by the Appeal Tribunal. Meanwhile the sanitary inspector, Mr. G. T. Randle, will act as surveyor's assistant, with a view to carrying on the duties in the event of Mr. Pike being called up.

Mr. H. F. Mence, surveyor to the St. Albans Rural District Council, has raised a road construction company for service in France consisting of 180 men, including about fifty from St. Albans. Most of the men have left for France, and as soon as suitable arrangements can be made, Mr. Mence will follow.

Mr. S. J. Harpur, engineer and surveyor to the Maesteg Urban District Council, has been appointed divisional surveyor for the northern district of Middlesex, under the Middlesex County Council, at a salary of £300 a year, rising to £350, with £65 a year towards the purchase, upkeep and running of a motor bicycle. There were 126 applications for the post.

Mr. H. Lionel Richardson, surveyor to the Martley Rural District Council, has obtained a commission in the Royal Engineers, on the Military Roads and Railway Department, and is now in France. Mr. Harry Treadwell, assistant county surveyor (with the sanction of the county surveyor, Mr. C. F. Gettings) has been appointed temporary surveyor during his absence.

Mr. J. C. H. Hartley, elder son of Mr. T. H. Hartley, borough engineer and surveyor of Colne, has been gazetted Second Lieut. in the Loyal North Lancashire Regiment. Lieutenant Hartley received his training in the Inns of Court Officers' Training Corps, and afterwards in an Officer Cadet Unit. Previous to joining the army eighteen months ago he was a pupil in the Colne borough surveyor's office.

Mr. G. Smith, surveyor to the Eton Urban District Council, has been appointed surveyor and water engineer to the Penistone Urban District Council, Sheffield. Mr. Smith is an associate member of the Institution of Civil Engineers, and has passed the examination of the Institution of Municipal and County Engineers. He has been excepted by the Army Medical Board from military service.

Mr. Frank P. Sissons, deputy surveyor to the Stoke-on-Trent Corporation, has been granted a commission as Second Lieutenant R.E., for road service

in France. He reported for service on April 5th, and was sent to France immediately. Of the borough surveyor's staff there remains in the drawing office only one man out of a staff of nine who were in the service of the corporation before the war, the following having joined the Army:—Technical Staff: F. P. Sissons, Second Lieutenant, Road Service, R.E., France; E. McGregor, Second Lieutenant, R.E., B.E.F., France; W. H. Baines, Second Lieutenant, R.E., retired, ill-health (died January 14, 1917); G. Spencer Hebden, Second Lieutenant, 2nd Leicester Regiment, killed in action, Mesopotamia, April 22, 1917; Norman Hardie, Second Lieutenant, R.E., killed in action, France, March 27, 1917; W. H. Beeston, Sapper, attached to Map Section, 59th Division, France; Albert Poulson, Sapper, R.E. Clerical Staff: S. H. Bullock, Second Lieutenant, 1st/1st Staffs Yeomanry, Egypt; H. Locker, Acting Quartermaster, A.S.C.; H. P. Leigh, Sergeant, R.E.; W. Hackney, Corporal, 3rd/5th North Staffs Territorial Regiment; C. Barker, Corporal, 3rd/5th North Staffs Territorial Regiment; E. H. Brindley, Trooper, 1st/1st Staffs Yeomanry (discharged, ill-health); W. Rayner, Third Writer, R.N.A.S., Mudros, Eastern Mediterranean; F. Rowley, Private, Royal Welsh Fusiliers; H. Robinson, Private, R.A.M.C.

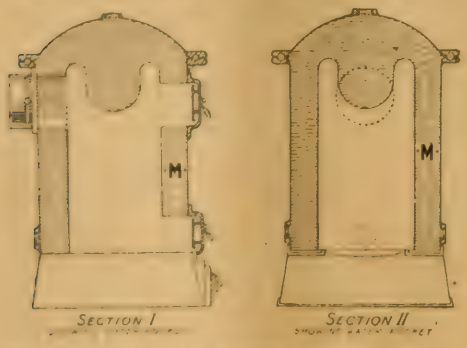
The following is the result of the election of officers of the Institution of Civil Engineers of Ireland for 1917: President, W. E. Lilly; vice-presidents, J. O. Moynan, P. H. M'Carthy. Members: F. Bergin, M. J. Buckley, A. D. Delap, J. H. Hargrave, G. M. Harriss, J. T. Jackson, P. F. Purcell, and W. R. Stephens. Hon. secretary, A. Hassard.

KILLED IN ACTION.

Captain G. Gush, who acted as architect to the Seaton Urban District Council, has been killed in action.

HOT WATER SUPPLY.

An apparatus which has already attracted the attention of a number of municipal engineers, and is deserving of serious general notice, is the "Baseco" patent boiler, a British invention and of British manufacture. In situations where a continuous supply of hot water is required, and for hot water heating with radiators, it is claimed to give the most perfect results. Its remarkable heating capacity is indicated by the accompanying sectional drawings, and its construction permits of the easy removal of the dome top in order to expose the whole of the interior for thorough and easy cleaning out, rendering brush or mechanical means unnecessary. An important point is that the whole of the interior exposed to the fire is backed by water, so that no part of the boiler can burn out.



BASECO PATENT BOILER.

The boiler is the outcome of many years' practical experience. It is of cast-iron made of the finest quality [illegible] and it is hardly necessary to say has considerable advantages in localities where soft water or water containing acids in solution is encountered. It burns coke or cinders, and is a useful and hygienic means for disposing of house refuse.

The boiler is obtainable in various sizes at most moderate prices, and would seem to be an ideal type of installation for use in municipal and public buildings of all kinds. The makers are Messrs. O. Bruster and Co. (Limited, successors to Messrs. H. C. Robotham and Co.), 4, Lloyd's Avenue, London, E.C. 3.

HOUSING AFTER THE WAR.

DEPUTATION TO LORD RHONDDA.

A deputation, arranged by the National Housing and Town Planning Council, who urged through their chairman (Mr. Harold Shawcross) and secretary (Mr. H. R. Aldridge) that local authorities should be immediately required to take steps to ascertain the needs of the working-classes in their districts, and to take action to carry out an effective scheme for meeting such requirements, was received by Lord Rhondda, President of the Local Government Board, on Monday. The resolutions passed at recent conferences of local authorities in favour of assistance being given by the Government towards a national scheme of house-building were submitted; and Lord Rhondda was informed that it was estimated that to overtake the lack of building during the war, and to clear away all slum properties, it would be necessary to build some 160,000 houses a year during the ten years following the war to provide healthy and sanitary houses for the working classes.

Mr. Hayes Fisher, Parliamentary Secretary of the Local Government Board, said it had been intimated that after the war there would be a shortage of some 500,000 houses. He thought the Government could give the best help by financial assistance, partly in the form of a free grant of money towards the building of the houses and partly by providing for a cheap rate of money.

Lord Rhondda promised to give his best attention to the subject. His department fully realised the importance of it, and the deputation could rely on a most sympathetic consideration being given to the question.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. EDWARD WHITWELL, F.I.S.E., M.S.A., Engineer and Surveyor, Abersychan Urban District Council.

GENERAL MEETING IN LONDON.

A general meeting will be held in London, at No. 4, Southampton-row, W.C. 1, on Wednesday, June 6th, at 6.30, when a paper,

"House Refuse: Its Calorific Value and its Possibilities,"

will be presented for discussion by Mr. Reginald BROWN, M.INST.C.E., M.I.MECH.E., F.S.I., F.R.SAN.I., &c.

The chair will be taken at 6.30 by Mr. Henry C. ADAMS, M.INST.C.E., M.I.MECH.E., F.R.SAN.I., the Acting President of the Institution.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR AND SANITARY INSPECTOR.—May 16th.—Barnoldswick Urban District Council.—Mr. Charles Thornton, clerk, Town Hall, Barnoldswick.

SURVEYOR.—May 19th.—Frimley Urban District Council.—Mr. F. T. S. Marsh, clerk, Urban Council Offices, Frimley, Surrey.

ASSISTANT SURVEYOR.—May 21st.—Dorset County Council. £150 per annum, with travelling expenses.—Mr. E. Archdale Ffooks, clerk, county offices, Dorchester.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 2nd. Eton Urban District Council. £150 a year.—Mr. J. E. Gale, 3, Sheet-street, Windsor.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

SOMERSET.—May 14th. For rebuilding the breast wall to bank supporting the Castle Cary to Somerton main road at Lavington, for the county council.—Mr. G. R. Folland, acting county surveyor, Wells.

WESTHOUGHTON.—May 14th.—For building 100 type "A" houses, for munition workers, for the urban district council.—Mr. George Hayes, engineer and surveyor, Town Hall, Westhoughton.

Engineering: Iron and Steel.

KEIGHLEY.—May 15th.—For an electrical installation in the ward block of the war hospital, for the Hospital Committee.—Mr. H. Webber, borough electrical engineer, Keighley.

CELBRIDGE.—May 18th.—For sinking a well and the erection of a pump, for the rural district council.—Mr. A. J. O'Connor, engineer, Council Offices, Celbridge, co. Kildare, Ireland.

WARRINGTON.—May 22nd.—For the supply of mechanical stoker, for the Electricity and Tramways Committee.—Mr. F. V. L. Mathias, borough electrical and tramways engineer, Howley, Warrington.

Roads.

WELLINGTON (SALOP).—May 15th.—For the supply of 50 tons of tar, suitable for painting, to Road Board's specification, for the urban district council. Mr. Geo. Riley, engineer and surveyor, Wellington.

DUNMOW.—May 16th.—For the supply of 1½-in. and 2-in. broken granite, for the rural district council.—Mr. A. E. Floyd, clerk, Dunmow, Essex.

BRUMBY AND FRODINGHAM.—May 19th.—For the supply of 2½-gauge best broken granite and 2½-gauge best slag, for the urban district council.—Mr. A. M. Cobban, engineer and surveyor, Council Offices, Frodingham, Lincs.

HALIFAX.—May 21st.—For private improvement works, for the Highway Committee.—Mr. J. Lord, borough engineer, Town Hall, Halifax.

ELY.—May 25th.—For the supply of 870 tons of machine-broken Leicestershire granite, for the urban district council.—Mr. W. McKelvie, surveyor, Ely.

Sanitary.

YEARDSLEY.—May 14th.—For the removal of refuse, for the urban district council.—Mr. W. Eyre, surveyor, Council Offices, Yeardsley, Cheshire.

TEMPLE EWELL.—May 15th.—For scavenging the parish, for the parish council.—The Clerk, Parish Council, Temple Ewell, Dover.

NEW ROSS.—May 22nd.—For the construction of sewerage works in Rosbercon, for the urban district council.—The Clerk, Urban District Council Offices, The Tholsel, New Ross, Ireland.

MELTON MOWBRAY.—May 30th.—For the construction of a sewer, about 350 yards in length, for the rural district council.—Mr. G. E. Fryer, Wyndham-avenue, Melton Mowbray.

THORNE.—May 31st.—For scavenging the town of Thorne, for the rural district council.—Mr. J. Stanley, surveyor, Orchard-street, Thorne, Yorks.

Stores.

WALSALL.—May 14th.—For the supply of shovels, forks, bowls, brooms, sewer grates, manhole covers, sewer pipes, and paving and road materials, for the corporation.—The Borough Surveyor, Town Hall.

TEDDINGTON.—May 15th.—For the supply of granite, flints, sewage precipitants, Portland cement and lime, household coal and coke, stoneware pipes, tar-paving and petrol, for the urban district council.—Mr. M. Hainsworth, surveyor, Enfield House, Teddington.

Miscellaneous.

KIRCALDY.—May 14th.—For the supply of twelve wagon covers, for the corporation.—Sanitary Inspector, Kirkcaldy, Scotland.

CLEETHORPES.—May 15th.—The council invite offers for the purchase of a Glover's Champion dust van, capacity four cubic yards.—Mr. Albert S. Barter, clerk, Council Offices, Cleethorpes.

GLASGOW.—May 15th.—For materials and jobbing work required by the Parks Department for six or twelve months, from June 1st next, viz.: (1) White metal and causeweying, (2) coal and dross, (3) fireclay and field drain pipes, (4) paint, oils, &c., (5) timber, (6) glass, (7) mason work, and (8) cartage work.—The Town Clerk, City Chambers, Glasgow.

GOLBORNE.—May 16th.—For the supply of disinfecting powder, plumbers' labour, gas for street lighting, sewerage pipes, brushes, spades, shovels and hire of steam roller, for the urban district council.—Mr. H. Eckersley, clerk, Council Offices, Golborne, Lancs.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BELCHAMP.—For the supply of broken granite and slag, for the rural district council.—Mr. S. Allpress, surveyor, Sudbury, Suffolk.

GRANITE.

Jndkins, Limited, Nuneaton,* 15s. 10d. per ton.
Chas. Abell, Limited, Atherstone,† 15s. 10d. per ton.
Boons, Limited, Nuneaton, 16s. 4d. per ton.
W. Griffiths & Co., London, 23s. 5d. per ton.
Johnston Bros., London, 21s. per ton.
Brooks, Limited, London, 23s. 9d. per ton.
Groby Granite Company, Leicester, 17s. 1d. per ton.

* Accepted 250 tons each.

SLAG.

Wellingborough Iron Company, Wellingborough,* 10s. 6d. per ton.
T. Butlin & Co., Irthlingborough, 10s. 11d. per ton.
Henry L. Cooper & Co., London, 12s. 10d. per ton.
W. Prestwich & Co., Dronfield, 12s. per ton.

* Accepted 400 tons.

SANDGATE.—For the supply of 9,000 gallons (more or less) of coal tar, for the urban district council.—Mr. H. Evans, surveyor, Council Offices, High-street, Sandgate.

Folkestone Gas Company, Folkestone,* 3d. per gallon at works.
Borough of Ramsgate (Gas Department), Boundary-road, Ramsgate, 3¼d. per gallon, free on rail.
Frank G. Holmes, Northfleet, Kent, 3¾d. per gallon, free on rail at Sandgate Station.
Forbes, Abbott & Leonard, Shoreham, Sussex, 4d. per gallon, delivered at Sandgate Station.
R. S. Clare & Co., Limited, Stanhope-street, Liverpool, 4¾d., delivered at Sandgate Station.

WINDLESHAM.—For the supply of 400 tons of 2-in. broken granite, 100 tons of 1½-in. broken granite, 100 tons of ¾-in. dust and tar paving materials broken to 1¾ in. and ½ in. respectively, for the urban district council.

Ellis & Everard, Limited, Bardon Hill Quarries.—Granite.
John Wainwright & Co., Limited, Shepton Mallet.—Tarred Materials.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MAY.

11.—Junior Institution of Engineers: Mr. F. D. Napier on "Works Records." 7.30 p.m.
12.—Association of Managers of Sewage Disposal Works: Visit to Wanstead, Essex, Sewage Disposal Works. 3 p.m.
15. Illuminating Engineering Society: Discussion on "Economies in Lighting in Relation to Fuel Saving." Society of Arts, John-street, Adelphi, W.C. 5 p.m.
17.—Institution of Electrical Engineers: Annual General Meeting. Institution of Civil Engineers, Great George-street, Westminster.
18.—Institution of Mechanical Engineers: Mr. A. E. L. Chorlton on "The Construction of Turbine-Pumps." Institution of Civil Engineers. 6 p.m.
18.—Junior Institution of Engineers: Mr. E. C. Barton, M.I.E.E., F.G.S., on "Metric Weights and Measures and Decimal Coinage."

JUNE.

1.—Town Planning Institute: Adjourned discussion on Mr. Rees Jeffreys' paper, "Road Construction and Improvements by Means of Town-Planning Schemes."
6.—Institution of Municipal Engineers: General Meeting in London. Mr. Reginald Brown, M.INST.C.E., on "House Refuse: Its Calorific Value and its Possibilities." 6.30 p.m.
21-22.—Incorporated Municipal Electrical Association: Annual Meeting. Institution of Civil Engineers, Great George-street, S.W.
28-30.—Institution of Municipal and County Engineers: Annual Meeting at Hastings.

APPOINTMENTS OPEN.

BARNOLDSWICK URBAN DISTRICT COUNCIL.

Wanted, a person over military age to act as Surveyor and Sanitary Inspector to the above Council for the duration of the War.

Applicants must be qualified Surveyors, and possess the Certificate of the Royal Sanitary Institute.

Applications, stating salary required, to be sent to the Chairman of the Council, on or before the 16th inst.

CHARLES THORNTON,
Clerk to the Council.

Town Hall,
Barnoldswick.
May 2, 1917. (3,406)

FRIMLEY URBAN DISTRICT COUNCIL.

APPOINTMENT OF SURVEYOR.

Applications are invited for the above appointment. Salary according to age, qualifications and experience.

Particulars of duties and Form of Application will be forwarded on receipt of a stamped addressed foolscap envelope.

Applications on the prescribed Form, accompanied by copies of three recent testimonials, should be sent to the undersigned not later than the 19th instant.

Canvassing Members of the Council, directly or indirectly, will disqualify.

By order,

F. T. S. MARSH,
Clerk to the Council.

Municipal Buildings,
Camberley.
May 4, 1917. (3,407)

ETON URBAN DISTRICT COUNCIL.

SURVEYOR AND INSPECTOR OF NUISANCES.

Applications are invited for the above whole-time appointment. Salary £150—office, stationery, &c., provided. The successful applicant must hold the testamur of the Royal Sanitary Institute and of the Institution of Municipal and County Engineers, and must have had practical experience in sewerage and sewage disposal, maintenance of roads under modern conditions, inspection of buildings and other municipal work.

Applications, giving detailed information as to training and experience, ages, &c., and accompanied by copies of recent testimonials, to be forwarded to the undersigned, marked on envelope "Surveyor," not later than Saturday, the 2nd June next.

Canvassing in any shape or form will disqualify.

J. E. GALE,
Clerk.

3 Sheet Street,
Windsor.
May 5, 1917. (3,405)

DORSET COUNTY COUNCIL.

MAIN ROADS AND BRIDGES DEPARTMENT.

ASSISTANT SURVEYOR.

Wanted, a Temporary Assistant Surveyor, ineligible for military service, for the South District of the county, and to act generally under the direction of the county surveyor, in the work of the department, both on the roads and in office work.

The person appointed must devote his whole time to the work and take up his duties as soon as possible.

Commencing salary at the rate of £150 per annum, with actual third-class rail and 2d. per mile for motor cycle. Offices, postages, and stationery will be provided.

All applications to be made on an official form (to be obtained of the undersigned), in candidate's own handwriting, and sent in, endorsed "Assistant Surveyor," with copies of not more than three recent testimonials, not later than Monday, 21st May, 1917.

E. ARCHDALL FFOOKS,
Clerk of the County Council.

County Offices,
Dorchester.
8th May, 1917. (3,409)

MISCELLANEOUS.

ROAD ROLLER for Sale, 5 tons, by Aveling & Porter. Tracks 4 ft. 6 in. Boiler recently retubed, insurable at full working pressure. In good condition throughout.—Apply Premier Asphalte Co., Carliol-place, Newcastle-on-Tyne. (3,399)

STEAM TIP-WAGON, Second-hand, required. —Write, giving full particulars and price, to the Borough Surveyor, Mansion House, Doncaster.
May 8, 1917. (3,408)

Write for free samples, prices & full particulars to

MacAndrews & Forbes, Ltd.
2 Broad Street Place,
LONDON,
E.C. 2.

The ROOT Fibre Board

Fiberlic

For Walls & Ceilings

The bathroom illustrated is only one example of what can be done with Fiberlic for distinctive effect.

The architect who planned and specified wall board for the construction, selected Fiberlic because he required a wall board that would be absolutely sanitary and vermin proof, in fact, he required the very finest wall board procurable.

Fiberlic answered all his requirements because of its great strength, durability and rigidity.

Being odourless, fire-resisting, sound-deadening, and thoroughly sized throughout, is suitable for any kind of room in any kind of building, but judge for your self — ask for sample and carefully examine.

The Surveyor

And Municipal and County Engineer.

Vol. LI. MAY 18, 1917. No. 1,322.

Minutes of Proceedings.

Sewage Disposal from the Chemist's Point of View.

Much has been said and written in many places, including these columns, upon the need for co-operation between engineer, chemist and biologist in designing new works for the treatment of sewage and in arranging the most suitable methods of operating existing works. Cases in which the engineer and the chemist act in collaboration have become more frequent in recent years, but there is still room for a wider utilisation of the work of the chemist. The more experienced the engineer the more likely is he to insist on the necessity for calling in a chemist to assist him in his work, and both chemist and engineer will attain greater success when working in collaboration than if either were working without the other. For these reasons the extracts printed on another page from a paper which appears in the April issue of the Journal of the Institution of Sanitary Engineers makes interesting reading. The author, Mr. Bertram Blount, F.I.C., approaches the subject of sewage disposal from the chemist's point of view, and a discussion of the paper in the form of written communications from six eminent engineers is printed with the paper.

It would have been even more interesting if the discussion had included a contribution from another chemist of experience in sewage treatment, especially as there are several points which have not been sufficiently dealt with in the discussion. For instance, Mr. Blount states that "the greatest difficulty in the disposal of sewage which is carried by water is the extreme dilution of the liquid." From this it might be inferred that strong sewage is more easily treated than weak, and if this is the author's view we do not think that many engineers will agree with him. Filters of sufficient capacity to produce a thoroughly purified effluent from a sewage the volume of which is equal to 15 gallons per head per day of the population will work equally well, and with less risk of causing a nuisance from smell, if the sewage is diluted to 30 or 40 gallons per head per day. This was recognised by the Royal Commission on Sewage Disposal in making its recommendations, which stated that a filter, the capacity of which is based upon certain figures suggested by the commission to deal with the dry-weather flow, is capable of treating three times this volume in times of storm when the sewage is diluted with twice its volume of rain water. Further, according to the figures given by the commission, a weak dilute sewage can be treated on a filter at twice the rate recommended for strong sewage. Again, in connection with sludge disposal it makes little, if any, difference whether the sewage is weak or strong. In either case the wet sludge usually contains from 92 to 96 per cent moisture, and the chief difficulty is, as Mr. Blount states, to remove this moisture and produce a dry powder containing not more than about 10 per cent water. Fortunately, greater progress in this direction has been made than the uninformed reader of the paper would be led to expect. Neither chemicals nor filter presses are required, and no labour is involved. The sludge is simply allowed to accumulate in the settling tanks under suitable conditions, and, with the "wave of the wand" suggested by Mr. Blount, certain species of the "lowly organisms" referred to earlier in the paper commence their functions by which the organic matter in the sludge is changed in character to such an extent that it is easily and rapidly dried in the open on properly constructed draining beds. Under the "suitable" conditions mentioned above, very little of the gas formed in the sludge escapes while it is in the tank, but it is liberated after the sludge has been discharged on to the draining bed, and in this way doubtless facilitates the draining away of the water. Contrary to what might be expected, this gas has no unpleasant odour. Instances are known where the moisture in sludge treated in this manner has been reduced from 92 per cent to 72 per cent in about eight days.

It should be noted that these remarks have no reference to the activated sludge process, but relate to treatment in settling tanks without aëration. Sludge containing not more than 72 per cent moisture is fairly firm, and can easily be removed from the beds with a spade and transported for use as a manure in the neighbourhood without greater nuisance than that created by ordinary stable manure and without any of the difficulties incidental to the application to the land of the crude liquid sewage. It is also possible to carry the treatment of this semi-dry sludge a stage further and to recover the ammonia in a form in which it can be used either as a more concentrated manure or, as at the present time, for other purposes. So far as we are aware, the most suitable method is that known as destructive distillation. Several installations of this type of plant are in operation at the present time, the gas produced in the course of the process serving to heat the furnace without the addition of other fuel. From the

evidence already available it is clear that much assistance in the disposal of sludge can be rendered by greater attention to its treatment before it leaves the settling tanks, either on the lines suggested above or by the adoption of the activated sludge process, which has an equal, or even a better effect. Unfortunately, progress in the directions indicated involves breaking away from existing methods, and the innate conservatism of the majority of the people of this country is probably the greatest obstacle to all progress in the art of sewage disposal.

* * *

Housing after the War.

The vigorous campaign that is being carried on by the National Housing and Town Planning Council in order to secure the immediate adoption by the Government of a comprehensive after-war housing policy was advanced a further stage by the deputation which recently waited upon Lord Rhondda. The object of the deputation was to submit to the President of the Local Government Board a number of proposals in regard to which action can be taken at once and without waiting for the passage of any new legislation. As we have so frequently pointed out, the practical suspension of building operations during the past three years has rendered almost intolerable a situation that was already acute. Indeed, it is now recognised as being essential, in the interests alike of returning soldiers and of the health of the community as a whole, that building on a very large scale should be undertaken without delay as soon as the necessary labour is procurable. If this end is to be accomplished, preliminary steps must be taken at once and without waiting for the conclusion of hostilities. This immediate action may be taken in three directions—namely, the selection of sites, the preparation of designs, and the development of a scheme for the provision of funds. First in order comes the selection of sites, in regard to which the deputation urged the Government to stimulate and encourage all local authorities who are eager to fulfil the national duty of carrying into effect housing schemes at the close of the war by providing special facilities enabling them to purchase or secure options on land, and to plan it on the best lines. The best stimulus that could be given would undoubtedly be an early announcement to the effect that at the close of the war housing loans, with generous grants in aid, will be available. Without such grants there is little or no prospect of the dire shortage of houses being supplied. Considered purely as a business proposition, the increased price of money alone would involve an increase of two shillings a week in the rent of each cottage, and to this must be added an even more serious increment, owing to the enormous advance in the cost of all building materials. For these reasons it will no longer be possible to discuss as a practical proposition the possibility of building cottages to let at an economic rent without involving any charge on public funds; and once the necessity for State aid is admitted, the advantages of an early announcement on the subject are obvious. The third point urged by the deputation was the desirability of an immediate invitation from the Government to architects and surveyors to submit, in a series of specially arranged competitions, designs for dwellings. It was suggested that these designs should be based on schedules to be drawn up by the Local Government Board defining certain standardised component parts which could be produced in large quantities, and prescribing certain general building conditions for rural and urban areas respectively. The adoption of standard component parts would certainly make for economy, and with proper safeguards need not lead to monotony or uniformity of design; and the adoption of general building conditions would be reflected no doubt in a much-needed revision of by-laws in many districts. Lord Rhondda did not attempt to reply to the proposals in any detail, but he made the very satisfactory announcement that he entirely shared the view of his immediate predecessor, Mr. Long, that housing was the most important question with which his department had to deal. Mr. Hayes Fisher, who also replied, recalled his remarks on the occasion of a deputation on the subject of a Ministry of Health—to the effect that at the root of all such questions as infant mortality, reduced death-rate, and improved public health, is the question of housing. It is to be hoped that the sympathetic words spoken by the chiefs of the Local Government Board will be transformed into effective action at the earliest possible moment.

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Street Numbering.

We have always held the view that the practice of identifying small suburban villas and terrace houses by fancy names instead of by plainly marked numerals is one which causes very great public inconvenience. It is with satisfaction therefore that we observe that the matter was the subject of a question in the House of Commons last week. The question, which related both to the numbering of houses and to the exhibition of street name plates, was addressed to the Postmaster-General, and referred more particularly to the removal of an obstacle to the efficient delivery of letters and telegrams. There is, however, another and almost equally important point of view from which the matter can be regarded. The ordinary member of the public, looking for an unnumbered house in a strange neighbourhood on a dark night, is surely entitled to some consideration. His difficulty is greater than that of the postman, who may at least be presumed to be familiar with the details of his round, and it has been considerably increased by the very drastic reductions that have been made in public street lighting. In answering the question, the Postmaster-General very properly pointed out that it is upon local authorities, and not upon the Post Office, that statutory powers in regard to street numbering have been conferred. These powers, it will be remembered, are derived from secs. 64 and 65 of the Towns Improvement Clauses Act, 1847, which are incorporated in the Public Health Act, 1875. Sec. 64 casts upon the local authority the duty of causing the houses and buildings in all or any of the streets to be marked with numbers as they think fit, and of causing to be put up or painted on a conspicuous part of some house, building or place at or near each end of every street the name by which it is known; while sec. 65 casts an obligation upon the occupiers of houses and buildings to mark their houses with such numbers (not names) as the local authority may approve, and to renew such numbers if they become obliterated or defaced. This is one of the minor duties of a local authority which is too often neglected, and which would often be better performed if the postal authorities, who have a direct interest in the matter, were to make definite representations in suitable cases.

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Foresight Rewarded.

We are in cordial agreement with the *Bradford Daily Telegraph* that the corporation of that city has reason to be grateful to at least one of its chief officials—Mr. J. Garfield, the chemist and engineer at the sewage works. Soon after war broke out the supply of sulphuric acid—which had been used as the precipitant at the Esholt works—was stopped; the Government required it for the manufacture of explosives.

The action of the Government led to many difficulties in those businesses where the acid had hitherto been indispensable. Something like £20,000 a year was spent on sulphuric acid for the Esholt tanks. Mr. Garfield looked ahead and secured enormous quantities of nitre cake to act as a substitute. This, as is well known, is the residue accruing from the manufacture of certain explosives, and at the time Mr. Garfield made his arrangements the cake—which had not then been adopted as a substitute, for its possibilities were then not generally known—had no market value; in fact, it was so much of a nuisance that it cost money to have it removed and disposed of. However, Bradford through this display of official foresight was made safe in regard to the treatment of its sewage—which, incidentally, made it possible for the Sewage Committee to sell £80,000 worth of grease last year—and the cake was secured at very trifling cost. At this time Mr. Garfield was called in by the Explosives Committee to advise on certain matters, and it is in recognition of his services that that committee, who have now found that the cake is in demand at a remunerative price, have formally intimated in a letter to the Sewage Committee that, while it has been decided to advance the price of cake to consumers generally, Bradford Corporation will be allowed to have its supply on the same terms as heretofore. In a sentence, this means that the services of Mr. Garfield to the department mentioned have resulted in the Sewage Committee being saved an expenditure of something like £140 a week. And yet, it would seem, there are people in the city council who grudged this official an advance of £100 given him a short time ago!

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The Importance of Water Economy.

The Metropolitan Water Board have a wide field in which to exercise their power of restricting the waste of water, and it is to be hoped that they will not fail to make use of it to the full. The prosecution on Monday of a Greenwich fishmonger for permitting waste showed that the tap was left running for a considerable time on many occasions over fish and potatoes in process of cleaning. The experience of the man in the street is confirmatory of the complaint that this is a form of sheer waste, typical of London as a whole, where the tolerance of the authorities is taken advantage of by hosts of people, who, in addition to being indifferent to consequences, have acquired by long immunity from interference an utterly reckless disregard of moderation in the use of water. It is to be hoped that the too frequent misuse of garden hose will also come under review, and that there will be established an *esprit de corps* among householders which, in the event of warnings going unheeded, will so operate as to lead to the prosecution of offenders. Economy in the use of water, as the President of the Local Government Board suggests in the appeal he has issued this week, can be effected in various ways, notably by the restriction of watering in gardens and limiting the quantity of water in the daily bath. This is really a highly important war-time economy, especially in large towns, and particularly where the water has to be pumped. It has been stated authoritatively as regards London, for example, that nearly 90,000 millions of gallons of water are annually pumped through 1,129,000 services, or nearly 242,000,000 gallons a day. This involves an expenditure in coal and oil fuel approximately equal to 190,000 tons of coal annually, exclusive of wear and tear of machinery, wages, and other items. The lack of labour and the rise in the cost of commodities are considerations that will tend to emphasise the importance of this subject to consumers in every part of the country.

Insanitary Conditions at Taunton.

There is an unfortunate tendency with Government Departments to go to extremes. They mingle a disposition to excessive interference which is fussy and irritating, with a proclivity for leaving things alone, with results which are too often unfortunate and sometimes serious. Among the examples of the latter must surely be classed a disclosure made recently at the Taunton Rural District Council by the medical officer of health, Dr. E. A. Poole. This officer had been notified of a case of cerebro-spinal meningitis at Otterford (a small village on the Devonshire border), and on visiting the place he found that one of twenty Irish labourers lodging at the Holman Clavel Inn had been removed suffering from the disease. Two days later he had to order the removal to hospital of three other men. It appeared that the twenty men had been housed in one room, which measured 30 ft. by 12 ft. by 8 ft. 6 in. The apartment was without any sanitary accommodation, and Dr. Poole had to put his foot through several panes of glass, because the windows were not made to open. The men were promptly ordered out of this plague spot, and it was stated that they were building a hut for themselves. The chairman of the rural district council certainly did not exaggerate when he stated that it was a scandal for a Government Department (the War Office) to send a gang of men, as these men had been sent, into a remote country district without making proper arrangements for their accommodation. It is obvious that this should have been done, or that, what would have practically amounted to the same thing, the local sanitary authority ought to have been informed of the intention of the War Office to send the men to the district. Considering what the consequences of official neglect have been, it was certainly not too much that the rural council should resolve to ask for an explanation from the military authorities.

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Engineering Standards.

The solid work which has been accomplished by the Engineering Standards Committee since its establishment in 1901 fully justifies the praise accorded by Sir John Wolfe Barry in the course of the James Forrest lecture which he recently delivered. The committee was formed by the five leading engineering institutions acting in concert for the purpose of "framing systematic standards to replace the increasing confusion in engineering manufactures due to engineers who design the work and manufacturers who execute it being without general guidance as to the really available form and composition of the manufactured articles or their component parts." From a modest beginning—the committee at first consisted of only seven members—the organisation has developed until at the present time there are a main committee of twenty-two members and no fewer than sixty-four sectional committees and sub-committees, as well as numerous panels, comprising in all well over 500 members, and dealing with standards relating to almost every branch of engineering practice. Up to the present seventy-seven standard specifications have been issued. A remarkable feature of the work is the small amount of money that has been expended, a circumstance which is chiefly due to the large amount of voluntary service that has been rendered. In this respect the committee compares very favourably with the Bureau of Standards in the United States—a body which is very liberally subsidised. Moreover, some £20,000 out of the total expenditure of £51,000 has been provided by the engineering profession in the form of direct contributions. The work of the committee has resulted in economies out of all proportion to the expense involved.

Cement Concrete Roads and Pavements.*

By T. HARRY JONES, M.CAN.SOC.C.E., City Engineer of Brantford, Ontario.

For the past twenty-eight years cement concrete has been used in Canada in the construction of sidewalks. In connection with the earlier walks its use was extended to the building of the walk crossing of street intersections, some of these built over twenty-five years ago being in good condition to-day. It was also used as a foundation for asphalt and other pavements. Later lanes were built of concrete, one having been constructed in Toronto in 1898. It was only ten years ago that concrete was first used for street pavements, six streets being constructed in Windsor of this material in 1907. Its use has grown till it is estimated that there are about 2,500,000 sq. yds. of this pavement in Canada, of which about 1,600,000 sq. yds. are in Ontario and 600,000 sq. yds. in the province of Quebec. In Ontario alone last year there was laid about 370,000 and in Quebec about 100,000 sq. yds., while in the United States it is estimated there are over 60,000,000 sq. yds. of concrete pavement in use to-day.

The most notable example of concrete roadway in Canada is the Toronto-Hamilton Highway, which, with the exception of a few miles at each end, was constructed between these cities during 1915-1916. It is on the leading thoroughfare between Toronto and Windsor, and is subject to an enormous traffic, which has greatly increased since its construction. Of the work done in 1915 less than four per cent of the slabs were cracked sufficiently to require filling, and about the same percentage required chipping, and two per cent chiselling; the greatest percentage of these occurred in the part of the pavement laid late in the autumn. The only surface defect in the whole pavement was a hole about 4 in. by 4 in.

EXPANSION JOINTS.

Transverse joints in concrete pavements are usually termed "expansion joints" and are left one-quarter inch in width and are filled with tar or asphalt. In some cases even wider joints are advocated. During the warm weather, when expansion occurs, the filling is soft and is pressed out of the joint. As abrasion occurs at the edges of the joint, the narrower the joint can be made, the better. The writer is of the opinion that in city pavements which are watered daily, and on residential streets partly shaded by the trees, little attention need be paid to the expansion of the slab. If a simple cut is made through the pavement which will allow for contraction, and care taken that it be vertical, the adjoining slabs should bear the compression.

In the construction of long stretches of sidewalk a good deal of trouble was caused by the buckling of the slabs during the hot weather. This was completely remedied by leaving a ½-in. strip in every city block. Why could not the same principle be applied to pavements, doing away with the cross joints and leaving a 2-in. bridge, say every 500 ft. in length?

In a two-course pavement (Park Avenue) constructed in Brantford in 1914, a strip 1½ in. wide was left between the blocks of the lower course which was afterwards drawn and filled with sand and the top course of 2 in. was cut through. No buckling has occurred in this pavement. This method was also followed in another pavement which was begun last year and is to be completed this year. In Chestnut Avenue pavement, laid in Brantford in 1911, longitudinal cracks have developed, excepting in a strip 11ft. in length, in which a longitudinal joint was left down the centre of the pavement, in which part no cracks whatever have appeared. Applying this principle in the Park Avenue pavement, one-half the width of the pavement was first constructed for the full length of the street and the other half joining it without any filler between. No longitudinal cracks have developed in this pavement. None of these pavements were reinforced.

MORE CRACKS IN EARLY PAVEMENTS.

While cracks in all pavements are objectionable, and should be eliminated, if posible, there has been a great deal more criticism in reference to these in concrete pavements than the facts justify. The writer the other day in a large city counted 120 cracks in about a quarter of a mile on the part that concrete between the street tramway track and the kerb, yet ordinarily they would not have been noticed. Most of the cracks in concrete pavements are in the earlier ones, when the specifications of to-day were not followed.

It will generally be found that cracks in a concrete road are attributable to either an improper foundation or lack of drainage, which generally goes with a clay sub-soil. In country roads cracks are often found on curves, where the road has been widened out, making a fill necessary.

EXAMPLES OF DURABILITY.

In reference to the durability of concrete roads there is a case of one in the United States in use about twenty-five years, and as usable to-day as when laid. A concrete lane laid in the city of Brantford in connection with a wholesale grocery warehouse was laid in 1902, and, excepting a few small cracks, is apparently in as good condition as when laid.

There is no reason why concrete should not be laid on business streets or those subject to heavy traffic. The experience in Wayne County has demonstrated this. The South Market Street pavement, laid in Brantford in 1912, near the intersection of the two main business streets on a grade of from 5 to 8 per cent, is another example.

Objection is sometimes made to concrete pavements on account of the difficulty in breaking through in making connections or repairs to services. It seems to be forgotten that the same objection largely exists in other pavements which have a concrete foundation.

REPLACING OTHER SURFACES WITH CONCRETE.

An interesting experiment has been made in Wayne County in re-surfacing an old concrete pavement with a 3-in. surface. From the experience obtained in repairing bituminous pavements on a concrete base with concrete, the writer believes that the experiment will be successful, and that when surfaces of other pavements have been worn out they can be replaced by concrete.

One of the difficulties in connection with concrete pavements—and others as well—is that they often have to be constructed immediately after the laying of sewers and other pipes and connections, the putting in of which has been necessitated by the proposed pavement.

The maintenance charges in connection with concrete pavements are less than that of any other class. This will be more appreciable as time goes on, and it is found that other pavements, with which concrete is compared, require replacing, while properly constructed concrete pavements, instead of lasting their estimated lifetime of, say, ten years, are good for another ten, and still another.

The light colour of concrete pavements, instead of being objectionable, is, in the opinion of the writer, desirable. The residential streets and roads generally are, or should be, shaded by trees, and the effect on a dull day or a dark night of turning from a dark pavement to one of concrete is pleasing.

Drivers using all classes of pavement testify that those of concrete are the least slippery. The roads are easily cleaned and more readily kept clean. They are less dusty, the surface being freer from voids or waves. This can be tested with the head lights of a motor at night, which exaggerates the unevenness, and while slight irregularities appear in concrete pavements, many others are like the waves of a lake when not too calm.

* From a paper presented at the Fourth Canadian and International Good Roads Congress at Ottawa.

ROADS IMPROVEMENT ASSOCIATION INVESTIGATIONS.

The council of the Roads Improvement Association, of which Prince Arthur of Connaught is president, at a meeting held in London on Tuesday last, resolved to act upon a recommendation that investigations should be made forthwith into the claims of concrete roads. The council of the association is in possession of much interesting data, from America and elsewhere, concerning the economy and durability of concrete roads with reinforced concrete foundations. Instructions have now been given by the association for a report to be prepared and presented by Mr. H. Percy Boulnois, M.INST.C.E., formerly city engineer of Liverpool and deputy chief engineering inspector to the Local Government Board.

The Treatment of Sewage.

By BERTRAM BLOUNT, F.I.C.

[Extracts—reproduced by permission of the author—from a paper contributed to the April issue of the Journal of the Institution of Sanitary Engineers.]

I have said that in large communities in civilised places water carriage is necessary. Although inevitable, it involves many difficulties, and some of these I propose to illustrate with examples from my own practice.

The greatest difficulty in the disposal of sewage which is carried by water is the extreme dilution of the liquid, an inevitable concomitant of the mode of carriage. This is much increased by the fact that sewers are ordinarily constructed to carry all waste liquid, and therefore include rain water. Dry-weather flow and storm water are very different things, but they usually go into the same sewerage system. Hence one of the troubles of treatment. Another serious difficulty is the flow into the sewers from time to time, and not periodically, of trade wastes, all going down holus bolus with ordinary domestic sewage.

From this it can easily be conceived that the task of purifying a waste material of variable composition and variable concentration so as to turn out an effluent acceptable to its ultimate outlet is no light one, and no golden rule can be laid down. Each case must be judged on its merits, and I have found in the course of my experience that attempts at generalisation are perilous and likely to lead to error. Provided the principles of purification are understood, each case must be approached with a perfectly open mind and a full appreciation of the local conditions.

In considering the best method of disposal of sewage, it must always be remembered that although no organism is a really efficient machine, it is usually better than any mechanical contrivance, and that, in spite of this, its exhaust may be of high value. Putting aside the functions of higher living things in utilising waste material, the chief gain in obtaining a useful circulation of nutritious matter is by the activity of those lowly organisms whose whole existence is occupied in the resolution of what is noxious to mankind to products which are of potential benefit. It is true that these products cannot always be turned to account, but wherever a nitrified product can be turned on to land there is so much plant food which in due course is returned, with the inevitable wastage of all such operations, as the pabulum of the beings which provided it.

The disposal of water-borne sewage has passed through many phases. The easiest and most obvious way is to turn the whole material into a stream or into the sea, but such primitive methods of disposal became obsolete with the growth of large towns, and some method of treatment had to be devised. For many years systems of sedimentation and chemical precipitation were the only methods in use, and though good work was done the problem was not fully solved. Then came bacterial treatment, and largely displaced former methods. I remember well when it was a novelty, and, like all novelties, had enthusiastic advocates and strenuous opponents.

INDUSTRIAL WASTES.

It may be accepted that for ordinary town sewage some form of bacterial treatment will work in a satisfactory manner, but as many towns have special industries, and these have waste water from those particular trades, difficulties arise, and although they may often be overcome without much alteration of ordinary practice, something directly adapted to the special need may prove necessary.

The most notable instance probably is the treatment of the sewage of those towns where wool washing is a staple industry. In days not so very long ago the waste water containing the wool fat and the soap used in washing was turned into the drain without any attempt at treatment. The condition of the sewage works and the nature of the resulting effluent may be easily imagined. More enlightened manufacturers or those who had been subjected to the pressure of local authorities "cracked" their "suds," *i.e.*, added sulphuric acid to the soapy waste waters, and recovered the mixed wool fat and fatty acids derived form the soap. This fat was regarded as of small worth, and I remember in one large town with which I had to deal the most strenuous opposition was offered to the suggestion that this very simple method of purification should be adopted at every works to the benefit in pocket of the manufacturer and to the great aid of the corporation, which had to treat the sewage containing this trade waste. At the date to which I refer I calculated that about £125,000 per year was being sent down the drain; the figures were never seriously disputed, far less refuted. Well do I remember giving evidence on this point before a Parliamentary Committee and being laughed at as a visionary and unpractical person, but there is an old saw which says, "They laugh best who laugh last," for to the best of my belief my dicta have proved true. I believe that now the same city has adopted a rational method, and is making much money by it.

It is not often that trade wastes are anything but a nuisance; they are not, as in the instance I have cited, a source of riches, and in the contrary case remains the question of how to get rid of them at least expense. "Pickle" from various metal trades is a troublesome material to handle when mixed with general sewage, and should certainly and by compulsion be treated on the works, sometimes much to the advantage of the owner. I have seen "pickle" from copper rods, turned straight down the drain and no doubt many similar cases could be given. In short, the British manufacturer of fifteen or twenty years ago was getting far too fat, prosperous and cocksure; he was, as a rule, the son of his father who had built up the business and left the youth with more money than was good for him and an ignorance enhanced by a public school and university training, with the result that he turned copper sulphate and wool fat down the drain.

The treatment of trades waste water, whether profitable or not to the trades, should be at the source, but a caveat must be put in. To demand of a trader in a manufacturing district that he produce an effluent fit to go into a trout stream is nonsense, and tyrannous nonsense. A stream is not a sewer, but it is the natural means of conveying material which will not interfere with its functions *qua* stream. Of late years so much attention has been paid to this point, and the old foolish idea that a rigid and universal standard of purification should be set up has been so thoroughly discounted that many controversies which were hot enough ten years ago had died a natural death even before the war; they are still dead. This does not mean to say that we can rest on our oars. The standard of purification must be steadily raised by any means suited to the local conditions. Panaceas and people with axes to grind must be put into their appropriate place, which is limbo, and the problem of removing all the offensive rubbish which congested human life brings about must be confronted in the broadest way.

SOME PRACTICAL DIFFICULTIES.

Before coming to what is likely to be the outcome of modern methods, I will give a few instances of practical difficulties. At one very large city the sewage was pumped into lagoons of considerable area, but insufficient for the purpose. The result was that the surplus was allowed to flow into an adjacent river without percolation through the ground. The condition of the river was filthy, and a complaint was justly made. A good deal of the trouble arose from the fact that at the beginning purely chemical treatment was proposed, with land treatment to follow, but although this was rational enough, both steps were inadequate. Modern methods were adopted, and I have reason to believe that the results were satisfactory. In another case of quite a different class, where most of the sewage was domestic, the local authority had been so ill-advised as to put its works close to a large private house. A nuisance no doubt existed and I believe an injunction was obtained by the owner of the house. Here a little consultation between the parties at the outset would have prevented any trouble.

Another instance (and I pick these almost at random from my collection) is where the waste from a tannery went into a sewer and was objected to by the local authority. Tannery refuse is admittedly difficult to deal with, but in this instance the owners adopted the attitude of fairminded manufacturers, who were prepared to do their best at considerable expense to im-

prove their efficacy, but were not able to say that the effluent should be better than the average sewage. In many of these cases a little common sense, a little give and take, an absence of red tape, a composition of local squabbles, and a steady view of what really has to be done and should be done, will do more to get rid of difficulties indigenous to the locus than actions at law. Most of us have had a good deal of experience of these, and though we love a good stiff technical fight, yet, on the whole, it would be better if dispassionate views were sought and mere legal technicalities avoided. And in saying this I speak against our monetary pecuniary interests, as these legal cases are often lucrative, but there is not one of the body I am addressing who would not rather put things right than wrangle about them.

THE NECESSITY FOR SYSTEMATIC TREATMENT.

By whatever method sewage is treated, that method must be systematic. It has been said above that the fortuitous process of sending everything into the sewer, whether storm water, untreated trades refuse, or ordinary domestic sewage, though an easy process, does not commend itself on any rational ground. A good deal of advance has been made in this direction. Storm water is put through roughing filters or none, and as the river is generally in spate at the time, what happens does not matter very much unless that river lower down is a water supply. Then it matters a good deal. I do not see how the storm water question can be dealt with except by a double system of sewerage, and shall be very glad to hear whether this is successfully in use on any large scale.

The other questions of systematic disposal are not so difficult, and have been touched upon above. I have a chemical laboratory in my private house, and if I empty a few c.c.s of sulphuric acid down the sink I feel guiltless of upsetting the arrangements at Barking. But what about the manufacturer who is pouring thousands of gallons of sulphuric liquor down the drain? There comes the necessity for systematic treatment. That manufacturer, either by himself or in conjunction with his fellows, must turn out something not too bad for the common sewer.

And the next step pursuing the idea of system? Naturally a treatment strictly devised according to the needs and habits of the district served. The final stage is to produce an effluent that, having regard to the character of the stream into which it is discharged, shall if possible make it better.

UTILISATION OF WASTE MATERIALS.

Any discourse on the treatment of sewage would be incomplete without reference to the numerous attempts which have been made to procure a valuable asset from waste material. These have hitherto failed consistently, but it does not follow that they will always fail. The fundamental difficulty is the dilution incidental on water carriage. It has been pointed out many years ago, and again lately, that this is an advantage disguised, and so it is within the bounds of reason. Let us put an A B case. There is so much stuff which by itself is offensive and possibly dangerous. The obvious way to get rid of it is to oxidise it. Aerial oxygen is cheap, and all natural waters are saturated with it; therefore let us have plenty of water as nearly saturated with oxygen as possible, and put the sewage into that. But though this is right enough it does not help much towards the utilisation of the valuable constituents of the sewage. Everything is oxidised. Almost all the carbon goes to CO_2, and is on a par with the CO_2 exhaled by the animal which produced the sewage. Some carbon, it is true, may have become CH_4, and in that case is either casually burned or goes to the carbon of the atmosphere. The nitrogen becomes nitrates but is of no immediate use in the ocean; to trace the transformations, the avatars, of all the elements concerned would be a fascinating task, but even if it were within my power, it would lead us far from our present subject.

The actual methods which have been properly tried have been directed towards the utilisation of sludge. In many cases a large quantity of sludge is produced, and is separated by filter presses. When the sludge has been thus expeditively made, it is practically valueless. This is because of the unfortunate habit of colloidal substances to hold water in quantity quite disproportionate to their merits. To dehydrate any crystalline substance by centrifugal action is a simple matter, but the drying of a colloid, which is a kind of physical hocus-pocus, is not so easy. Witness peat, which is full of water with sewage sludge. Both are materials of high intrinsic value, but both handicapped by their retention of water.

WATER IN SLUDGE.

Average sewage sludge contains 85 per cent of water, and the difficulty of the removal of this is the reason why a material which could be freely used is a drug in the market. If by some wave of the wand that water could be got away from the sludge, there would be little talk of the cost of sewage disposal works, but up to the present the wave is not forthcoming. The whole water is physical, as the adhesion of water to colloids has nothing to do with their chemical affinities, and in this respect I think that we may properly ask our physicists to enlighten us. We all know, of course, that water will adhere to surfaces, the elementary example being the mounting of water in a capillary tube, but from that it is a very long step to say that as sewage sludge is colloidal, therefore the water will remain with it. I ask for information, and I want it put in terms of energy—the thing which seems most to vex those physicists who concern themselves with surface phenomena.

The practical upshot is that not only has the water in the sludge to be evaporated with the usual expenditure of thermal units, but that the evaporation takes pace at a slow rate. An instance of the kind within my personal knowledge may illustrate this. There was a waste material at a works which had to be precipitated so as to provide an effluent suitable to the stream, the purity of which was not high. It occurred to the owner of the works that this waste material might be suitable for making hydraulic lime, and so it proved. But on account of the moisture in the calcareous material and the tenacity with which the water was held by the colloidal masses associated with it, the rate of drying was too slow in the open unless a large area had been available. There was no question of nuisance. Translate all this into terms of sewage sludge, and one sees how difficult it is. May the solution be to get that water out of the sludge by purely physical methods? Many efforts have been made, but as far as I know none has succeeded. I dismiss the idea that the expenditure of energy necessary to wrest the colloidal solid from the water is of any practical significance. The phenomenon is molar and not molecular, in my opinion, and if I am wrong, I am anxious for correction.

If once this water question were settled, there would be little difficulty in utilising the sludge. At the instance of an eminent engineer well known to all of you, I carried out some experiments a few years ago on this very point. The sludge was by no means abnormally good, but the values obtainable from it were surprisingly large. There is no doubt at all that valuable material is being cast away daily by the thousand tons, and it is none the less true that until some means is found to get the real dry solids by themselves free from water without the cost of evaporating that water, this appalling waste will go on. It is no use blinking the facts. When an enthusiastic inventor comes to you for advice, do not turn him down; it may be that he has blundered on the truth. On the other hand, think historically of the many valiant attempts which have been made by many sanguine people, and, above all, think quantitatively.

DESTRUCTIVE LIQUIDS.

The treatment of sewage on the systematic lines which have been indicated involves the production of an effluent suitable to the condition and quality of the ultimate natural channel by which it is finally disposed of, but the intermediate steps are not free from danger. Apart from the attack on the materials composing the sewerage system, which may occur with any sewage, especially those containing acid trades wastes, there is another source of trouble often overlooked.

Much excellent sewerage work has been done in concrete, reinforced or not, and used as pipes of large diameter. It is commonplace that brick-lined sewers are set in cement mortar. Now, suppose an innocent non-acid sewage enters one of these channels. Who would predict disaster? And yet disaster has occurred.

It fell to the author's lot to examine a case of this kind. The channel was of concrete, and the quality of this was not questioned. The lower part of the channel where the sewage flowed was intact. There was some sign of corrosion at the line between wind and water, and the arch was badly corroded. On investigation, the matter was easily cleared up. An apparently innocent liquid was discharged into the sewer, and had no action *per se* on the concrete, but in the course of time it decomposed and gave off

sulphuretted hydrogen. This in its turn was oxidised and became converted into sulphurous acid, which at once settled on the lime of the concrete. As the sewer was well ventilated, there was plenty more oxygen, and the SO_2 (especially as it was in the form of calcium sulphite) became SO_3 and formed calcium sulphate ($CaSO_4$). If there is one thing more fatal than another to the stability and permanence of cement, it is calcium sulphate, and destruction naturally ensued.

That is a simple case illustrating the pitfalls which beset the path of the engineer who strives to obtain an effluent suitable for the channel which is to receive it, and once more I plead for a further collaboration between the engineer and the chemist. Surely I must be a very Cassandra—a voice crying in the wilderness—for I have been preaching closer union throughout my professional life. Cassandra's prophecies, though despised at the time, were right. The original Cassandra prophesied correctly always of disaster. I take the other view, and, putting myself into the mantle of Cassandra, prophesy success.

[A number of well-known engineers have discussed Mr. Blount's contribution in written communications which are printed with the paper in the April issue of the Journal of the Institution of Sanitary Engineers. Extracts from these communications will be given in our next issue.]

SEWAGE DISPOSAL IN SHANGHAI.

By Arthur Stanley,
Health Officer.

The past policy of the Shanghai Health Office has been one of unequivocal opposition to the introduction of water-closets. An extension of this policy was an endeavour to limit their number after it was found impossible to prevent introduction. The point of view is now an entirely different one—namely, to devise the most suitable manner for dealing with a necessary evil, especially to be able to meet the important question of disposal of water-closet drainage so that the water supply may be safeguarded.

The Sub-Committee on Water-closets of the Building Rules Commission, of which the writer was a member, recommended that water-closets should drain into cesspools and that the council should remove the contents. It was implied that removal would be done by tank carts and that disposal would be on similar lines to the disposal of nightsoil—namely, to be taken up country by boats and used on land as a manure. It seemed, however, to be recognised that there was a limit to the adoption of this method, and it was stated that 1,000 water-closets might be the limit.

As a sequence to recommending the cesspool and tank cart removal system it appeared to the sub-committee advisable to forbid the use of septic tanks.

After a period of working according to the rules formulated the difficulties of dealing with the increasing number of water-closets became more apparent.

Seeing that only a small section of the community will be likely to instal water-closets, say not more than 13,000 persons or 1-50th of the population, the necessity for a big, costly and difficult sewage scheme consisting of a separate drainage system for water-closets and purification works began to appear less insistent.

It would seem the obvious duty of a health officer to recommend the method which would effect the greatest degree of purification. But sanitation is largely a financial matter and a due sense of proportion is required in recommending measures. A separate drainage system for water-closets with purification works would probably result in a greater degree of purification before discharge into the waterways than any other practicable method.

Attention may here be called to the peculiar conditions which exist in Shanghai:—

1. The great preponderance of the Chinese population which will continue to use the old conservancy methods.

2. Fæcal contamination of the waterways by the very large boat population, against which it is practically impossible to do anything effectively. It is calculated that this boat population (12,600 in 1910 for this settlement alone) is considerably greater than the probable number of users of water-closets.

3. The existence of populous areas beyond settlement limits over which the council has no control.

These circumstances minimise the necessity for an ideal scheme of purification within the settlement.

The conditions in Shanghai and in this settlement are so different from those at home that the methods of English sewage practice are not necessarily applicable.

The advantage to be derived from the adoption of a separate water-closet drainage system and purification works should be commensurate with the large expenditure involved. Practical financial values rather than ideal results should be looked for.

SEPTIC TANKS.

There can be little doubt that the present method of disposal of water-closet sewage by means of cesspools and tank carts and disposal in the same way as nightsoil will soon become impracticable. This might be overcome by having tank boats to discharge cesspool contents on a falling tide, but no precedent whatever can be found for this mode of disposal, which would seem to be within the region of unrestrained extravagance. The only other practical way of disposal that intervenes between the cesspool emptied by tank carts and disposal of in the same way as nightsoil and a separate sewage system with purification works is the septic tank as applied to individual water-closet installations.

Although it appeared necessary to condemn septic tanks when fighting against the introduction of water-closets and for their limitation after introduction, they may now be looked on with more favour and every opportunity taken for collecting information regarding their value and possibilities of improvement.

Professor Sir Leonard Rogers, Professor of Pathology and Bacteriologist at the Medical College, Calcutta, and the leading authority on scientific medicine in India, after a series of tests on "the influence of the septic tank on pathogenic bacteria," concludes: "The septic tank process is inimical to most of the pathogenic organisms. There is little likelihood of the cholera bacillus surviving the action of the septic tank process. The chemical conditions of the septic tank are distinctly inimical to the typhoid bacillus, which rapidly decreases and, after a few days, disappears. The Malta fever organism, the Shiga bacillus of dysentery and the plague bacillus die out very rapidly."

Again, Professor W. J. Simpson, Professor of Hygiene at King's College, London, Lecturer in Hygiene in the London School of Tropical Medicine, and previously Health Officer of Calcutta, says: "Notwithstanding the concentrated nature of Indian sewage, it is quite as effectually dealt with by the bacterial or septic tank system. Indian sewage treated on the same estimates as English sewage results in failure. Of the different systems probably the septic tank is the most suited to the tropics. Larger tanks and more prolonged exposure under anærobic conditions are required in the tropics."

In Shanghai the problem is not the treatment of domestic sewage, but of water-closet sewage alone. As the destruction of disease germs is the main criterion, and the liquefaction of solid fæcal matter of next importance, it is considered that the longer the stay in the septic tank the better.

A tank large enough for a three-days' accumulation is considered most suitable, that is to say, an apparatus a little larger than the cesspools now required by the rules. The construction should be of concrete and be divided into three compartments, the inflow and outflow pipes opening below the surface so as not to disturb the purifying scum, and the third compartment to contain a rough filter to retain any solid particles that may have escaped liquefaction or sedimentation. At the exit there would be an inspection box for the taking of samples. Each compartment would be provided with a manhole to remove sludge about every six months. The tank should be protected so far as possible from the cold so as to promote bacterial growth. It is expected that a well designed septic tank of this nature will in addition to destroying or reducing the number of any disease germs that may be present also effect such a degree of purification as will render the effluent suitable for discharge into existing sewers, drainage ditches or creeks.

' Extract from Annual Report.

HOUSING AND TOWN PLANNING IN 1916.

SCOTTISH LOCAL GOVERNMENT BOARD'S REPORT.

In their report for 1916 the Local Government Board for Scotland state that the forces recorded in their previous report as operating to curtail the customary activities under the Housing Acts have continued throughout the year under review in an even more intensified form, with the result that the ordinary work of the department has been almost wholly suspended.

HOUSING.

The entire energies of the staff—both administrative and technical—have been devoted to assisting the Admiralty and the Ministry of Munitions to provide the housing accommodation required by these Departments for war workers. Some of the housing schemes have been promoted by the board direct; others, at the board's request, have been carried out by the local authorities within whose districts the accommodation was required. But whether the board undertook the schemes directly or vicariously, they had the duty of adjusting agreements, plans, specifications and contracts, exempting labour, facilitating the provision and transport of material, and generally expediting construction. They are satisfied that in all cases a desirable type of house has been provided, and that after the war the accommodation will be readily absorbed by the normal demand of the working-class population. They, however, consider it inexpedient to disclose particulars of the schemes during the war.

During the year the board reported by request (1) to the Royal Commission on Housing as to the estimated shortage of working-class houses, and (2) to the Reconstruction Committee on specified aspects of the housing problem and the measures that might be taken to encourage building enterprise after the war. If opportunity serves during the coming year they hope to formulate preparatory measures that may tend to facilitate expedition in action when the time arrives. In their view it may well happen that the question whether the building of working-class houses will be permissible immediately after the war will depend in large measure upon ability to enter upon operations without delay. Accordingly, they repeat what was said in their previous report as to the desirability that local authorities so far as their resources permit should now be acquainting themselves with the housing conditions and requirements of their districts, estimating the number and character of houses required, considering suitable sites and their layout, preparing plans, and generally developing the lines on which they suggest that future action should be taken. In this connection the board are prepared to make every effort to guide and assist.

INCOME TAX.

The board's advice has been asked as to the assessment of income tax on housing schemes promoted by local authorities on borrowed money. As the question is of importance, they have taken the views of the Inland Revenue Authorities, and they give a summary of the position.

In the first place income tax is chargeable on the nett assessable rentals, viz., the gross rentals less the amount of annual rates and one sixth for repairs. In respect however, of the burdens on the property [illegible] and interest charges local authorities are entitled to retain the amount of income tax payable thereon where these burdens are less than the nett assessable rentals and consequently the amount of income tax actually suffered in such instances is the difference between the tax on the nett assessable rental and the burdens. In the case of property the burdens on which are equal to or exceed the nett assessable rental, no income tax is suffered. Where interest charges are payable without deduction of tax [illegible] Public Works Loan Board relief can be claimed, by application to the local surveyor of taxes, in respect of the tax which might have been deducted from such interest.

DEMOLITION ORDERS.

For the guidance of local authorities as to their duty under Section 18 (2) of the Housing, Town Planning, &c. Act 1909 with respect to Demolition Orders, the board enclosed a copy of a letter that they addressed to a local authority, intimating an opinion by the Scottish Law officers of the Crown.

The Local Government Board have had under consideration your letter of 7th ultimo, asking for elucidation as to the duties of local authorities under sec. 18 (2) of the Housing, Town Planning, &c., Act, 1909, in regard to the pronouncement of Demolition Orders in respect of dwelling-houses closed by Order, and proposed to be used for purposes other than those of human habitation.

"The board have also had before them the opinion of the Scottish Law Officers of the Crown as appearing in their annual report for 1912, and the cases cited in your letter—namely, *Lang* v. *Fleming's Trustees* (Scottish Law Review, 1894, 10.47) and *Lancaster* v. *Burnley Corporation*, 1915 (1 K.B., 259).

"In view of the divergent views taken by the authorities on this point and the importance of the question involved, the board have thought it well again to consult the Law Officers, and they are now advised to the following effect:—

"The duty of a local authority under sub-section 2 of sec. 18 of the Housing, Town Planning, &c., Act, 1909, is *imperative* and not discretionary in every case to which the sub-section applies; and if it appears that the alternative provisions of the sub-section have not been fulfilled as regards a dwelling-house affected by a Closing Order, then the local authority have no option but to make a Demolition Order. The owner of the condemned property has, however, a general right of appeal against a Demolition Order under sub-section 4 of the above section, and under sec. 39 of the statute the appellate tribunal has power to quash a Demolition Order if satisfied that the dwelling-house is no longer to be used as such, or for human habitation, but is going to be turned to some other purpose not inconsistent with the objects of the Act."

TOWN PLANNING.

During the year under review town planning operations have remained in virtual abeyance. Only one formal application was received by the board—namely, that by the local authority of the Burgh of Kirkcaldy, for approval of a scheme. Three such applications—by the local authorities of the Burghs of Dunfermline, Edinburgh (Fountainbridge), and Kirkcaldy—are now before the board, but pressure of more urgent work has prevented their giving them the detailed consideration which is essential before they can signify approval. In the case of the two first named, however, a preliminary analysis of the provisions of the schemes has been completed.

Inquiries were held during the year by the board's Commissioner into the applications for authority to prepare schemes by the local authorities of the Middle Ward District of Lanarkshire (Cambuslang and Carmyle areas), the Lower Ward District Committee of Lanarkshire (Burnside area), the Upper District of Renfrewshire (Easter Renfrew area), and the Burghs of Rutherglen and Edinburgh (Duddingston area). Except in the case of the last named, the Commissioner has submitted his reports on these applications, but owing to the presure of work already referred to the board have found themselves unable to dispose of them.

The board have given very careful consideration to the report of their Commissioner on the applications by five local authorities for authority to prepare town planning schemes for a large territory—partly burghal and partly landward—lying on the north side of the Lower Clyde valley. These applications, pertaining as they do to overlapping territory, have presented many difficulties, and, with a view to the establishment of a mutually acceptable procedure devised to meet the exceptional circumstances, the board have conferred with the local authorities concerned in reference to the suggestion that a homogeneous scheme for a defined part of the scheduled areas should be prepared by a joint committee on which the foregoing local authorities interested would be represented. As the result of these meetings a *modus operandi* has been adumbrated and was being considered at the close of the year.

TOWN PLANNING INSTITUTE.

ADJOURNED DISCUSSION OF MR. REES JEFFREYS' PAPER.

We are asked to state that the adjourned discussion on the paper, "Road Construction and Improvement by Means of Town Planning Schemes," which Mr. W. Rees Jeffreys read at the last meeting of the Town Planning Institute, will take place on Friday, June 1st, at 6 p.m., at the Surveyors' Institution, 12, Great George-street, Westminster. The attendance of visitors is cordially invited.

Waterproofing.—We are asked to announce that the basement of the Masonic Hall at Grimsby, which was a continual source of trouble owing to flooding after heavy rains, has been successfully treated with waterproofed cement. The makers of Pudlo (the waterproofer used) will be pleased to give advice to any interested readers on making watertight any structure which may be subject to dampness or flooding.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

ELECTION OF DISTRICT OFFICERS, 1917-18.

At the last meeting of the council of the Institution of Municipal and County Engineers the secretary reported that in no case had more than the necessary number of members been formally nominated for district officers, and that no elections would therefore be necessary.

The following gentlemen have been nominated to the offices set opposite their names:—

METROPOLITAN DISTRICT.

Chairman—G. W. Humphreys (London County Council).
Representatives on Council—O. E. Winter (Hampstead), N. Scorgie (Hackney).
Hon. Secretary—N. Scorgie (Hackney).

NORTH WALES DISTRICT.

Chairman—J. P. Evans (Wrexham).
Representative on Council—Wm. Jones (Colwyn Bay).
Hon. Secretary—J. H. Edwards (Wrexham).

WEST MIDLAND DISTRICT.

Chairman—A. T. Davis (Salop).
Representative on Council—G. Green (Wolverhampton).
Hon. Secretary—F. C. Cook (Nuneaton).

SOUTHERN DISTRICT.

Chairman—J. Pickering (Cheltenham).
Representative on Council—L. S. McKenzie (Bristol).
Hon. Secretary—W. J. Goodwin (Salisbury).

EAST MIDLAND DISTRICT.

Chairman—E. G. Mawbey (Leicester).
Representative on Council—W. B. Purser (Kesteven).
Hon. Secretary—T. Wood (Leicester).

SOUTH-WESTERN DISTRICT.

Chairman—J. Paton (Plymouth).
Representative on Council—T. Moulding (Exeter).
Hon. Secretary—D. Edwards (Taunton).

SOUTH WALES DISTRICT.

Chairman—D. M. Jenkins (Neath).
Representative on Council—G. A. Phillips (Cardiff).
Hon. Secretary—H. A. Clarke (Briton Ferry).

NORTH-EASTERN DISTRICT.

Chairman—F. W. Spurr (York).
Representatives on Council—J. P. Wakeford (Wakefield), W. J. Steele (Newcastle).
Hon. Secretary—W. E. H. Burton (Wakefield).

NORTH-WESTERN DISTRICT.

Chairman—J. S. Brodie (Blackpool).
Representatives on Council—E. Worrall (Stretford), J. A. Settle (Bury).
Hon. Secretary—E. Worrall (Stretford).

SCOTTISH DISTRICT.

Vice-President—J. Lee (Paisley).
Chairman—J. Thomson (Dundee).
Representative on Council—A. Stevenson (Ayr).
Hon. Secretary—D. A. Donald (Grangemouth).

EASTERN DISTRICT.

Chairman—H. T. Wakelam (Middlesex).
Representatives on Council—J. A. Webb (Hendon). W. R. Hicks (Ealing).
Hon. Secretary—P. T. Harrison (Chelmsford).

SOUTH-EASTERN DISTRICT.

Chairman—H. T. Chapman (Kent).
Representative on Council—A. Dryland (Surrey).
Hon. Secretary—J. L. Redfern (Gillingham).

AFRICAN DISTRICT.

Chairman—A. E. Snape (Cape Town).
Hon. Secretary—T. W. Stainthorpe (Pretoria).

INDIAN DISTRICT.

Chairman—L. P. Marshall (Rangoon).
Hon. Secretary—M. Lea (Karachi).

IRISH DISTRICT.

Vice-President—M. J. Buckley (Dublin).
Chairman—J. F. Delany (Cork).
Representative on Council—R. H. Dorman (Armagh).
Hon. Secretary—M. Sellars (Dundalk).

ANNUAL MEETING: PROVISIONAL PROGRAMME.

The following are the arrangements which have been made up to the present in connection with the 44th annual general meeting of the institution, which is to be held at Hastings on June 28th, 29th, and 30th:—

Thursday, June 28th.

General business of the institution.
Presidential address and presentation of premiums.
Conference

Friday, June 29th.

Conference.
Lunch at the Town Hall, Hastings, by invitation of the Right Worshipful the Mayor of Hastings.
Visit to the Brede Valley Waterworks of the Hastings Corporation. Tickets, 4s. 6d. each.
Smoking concert at the Albany Hotel, Hastings.

Saturday, June 30th.

Visit to Battle Abbey, by kind permission of Sir A. Webster, Bart. Tickets, 4s. 6d. each.

PRELIMINARY LIST OF PAPERS.

1. "Public Abattoirs," by H. A. Brown, engineer and surveyor to the urban district council, Weston-super-Mare.
2. "Extraordinary Traffic and Excessive Weights on Highways," by H. T. Wakelam, M.INST.C.E., county engineer, Middlesex.
3. "Examinations," by E. Willis, A.M.INST.C.E., engineer to the urban district council, Chiswick.
4. "Dry Rot," by E. J. Goodacre, A.M.INST.C.E., assistant borough surveyor, Shrewsbury.
5. "Some Municipal Works of Hastings," by G. F. Miller, assistant borough engineer, Hastings.

The president-elect (Mr. P. H. Palmer) will be glad to receive offers to read papers at the meeting.

NEW OMNIBUS ROUTES.

MIDDLESEX LOCAL AUTHORITIES AND COUNTY COUNCIL'S PROPOSAL.

At a meeting on Monday last of the executive council of the Middlesex District Councils' Association consideration was given to the proposal of the Middlesex County Council that they should be the sole highway authority for the county to exercise the powers contained in sec. 20 of the Local Government (Emergency Provisions) Act, 1916. It was pointed out that it appeared to be somewhat uncertain whether the various highway authorities could legally delegate to the county council the right to give "consent" under sec. 20 to the appointing of new omnibus routes, and therefore that in any event the action of the provision in question was only of a temporary nature, and would come up for further consideration soon after the close of the war.

A resolution was thereupon passed recommending that, having regard to the fact that sec. 20 of the Act is only in force during the continuance of the war, and possibly for one year thereafter, and in view of the improbability of many new omnibus routes being started during the war, and of the probability that the whole question of omnibus routes and the maintenance of highways will be affected by new legislation soon after the end of the war, the various highway authorities should not assent at this stage to the proposals of the county council.

Tramways and Light Railways Association. — The annual conference of this body will be held at the Lecture Theatre of the Institution of Civil Engineers, Great George-street, S.W., at 2.30 p.m. on Friday, June 29th. The first business will be the annual general meeting of the association, at which new members of the council will be elected. Mr. Arthur Norton, A.M.INST.C.E., A.M.I.E.E., will read a paper on "The Manufacture, Life and Maintenance of Tramcar Tyres," illustrated by diagrams and lantern slides. Among the subjects to be discussed will be "Standardisation of Conditions of Labour and Rates of Pay," by Mr. E. H. Edwardes, A.M.I.E.E., general manager and engineer, South Lancs Trams Co.; "Fares," by Mr. A. V. Mason, M.I.E.E., general manager, South Metropolitan Trams Co.

Correspondence.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ.

(One man does not see everything.)—Euripides.

DECIMAL WEIGHTS, MEASURES, AND CURRENCY.

To the Editor of The Surveyor.

Sir,—I beg leave through your valuable weekly to place some final proposals before the public. The Decimal Association has communicated its views to you, so I particularly address its members. I shall assume your readers have seen my letters in your issues dated October 13, 1916, and January 19, February 2, April 27, and May 4, 1917, and are acquainted with the construction of the tripod, first published in *Nature*, *Engineering*, and subsequently in book form, and explained in general terms in your columns.

Three coincidences are held to establish a scientific theory, and there are at least twenty to prove the existence of the tripod. The evidences of the antiquity and internationality of the tripod are, in my opinion, overwhelming, and they must either be accepted or disposed of; or else I must be accounted to be the original inventor, a thing manifestly absurd when the construction and history of the system are studied. The personal element is therefore eliminated, I hope, finally. The proposition is an ancient one, to be proved or disproved, and I trust the Decimal Association will apply itself to the problem.

For the present we are concerned only with the decimal scales and the *Systèmes Usuels* in British weights, measures, and currency. The dual system in weights and measures is (*a*) the metric system with a 5-bank metre as the basal unit, and (*b*) the common tables in general use to-day. Similarly, in British currency we can divide the pound sterling (*a*) into 1,000 imaginary cents, and (*b*) into shillings, pence, and farthings. The (*a*) scales serve those who prefer decimals; the (*b*) scales those who must employ vulgar fractions. The two sets of units are commensurate and readily interchangeable. They coincide to as low a point (*e.g.*, the cwt. and the florin) as practicable; and below that, the stone, the eighth of a cwt., is ·00625 of a ton, while the eighth of a shilling is also ·00625 of a £. They help everybody, and favour nobody.

The mistake we make is to employ the British *Système Usuel* exclusively with both decimals and vulgar fractions. The discovery of the British metre has removed all difficulties, making the system easier to learn, to understand, and to remember. It rests with the Board of Education to take the hint, and to insist upon decimals being taught primarily in the decimal scales, and vulgar fractions in the *Systèmes Usuels*. For so long as schools and colleges mix the two in their curriculums, the British will be plagued with a "distracting jumble."

The British decimal system and the metric system should be taught together, so that no time will be lost here. The simplification of the *Systèmes Usuels*, as shown in my book, and the suggested revolution in teaching decimals and vulgar fractions in appropriate tables will save a very great deal of time. I would treat the *Système Usuel* and vulgar fractions thoroughly first, and go on to decimals and the theory of the system. To teach decimals and then vulgar fractions is fatal. The ·0625 of a ton, the 160th part, we call a stone for shortness. If we say 1,000 kilos., or 1,000,000 grammes make a ton, and that a stone is 6,250 grammes or 6·25 kilogrammes, how do we gain? The figures convey no impression to the average mind. It is not easy for the average man, woman or child to visualise a thousand. Is it easy, even for a mathematical mind, to visualise a million? Taught the other way about, scales (*b*) include portions of (*a*), and the special case of tons and tenths presents less difficulty. To the question that decimals, if taught properly, make the use of vulgar fractions unnecessary, I can only oppose the common experience of mankind. Ninety per cent. of humanity do not live by learning arithmetic, and in all the common affairs of life vulgar fractions play an essential part.

So convinced am I of this that I feel sure, if the French desire ever to pass the common standard for the Empire, it would be necessary to introduce some form of the *Système Usuel* in weights and measures, and use it in France. One thing stands out very clearly—we already have a metric system, and a decimal currency, and *Systèmes Usuels* strictly commensurate with the same. We can therefore visualise the effects of a change to pure decimals, and, indeed, if we think proper, give it a practical trial before we "burn our boats."

The proposals which follow are presented as a practical, workable solution of the international problem:—

(1) The metric system to become the international scientific standard of pure science and reference.

(2) The British decimal system to be the international system of applied science for trade, commerce, engineering, and such practical professions as desire a metric system for practical use with a *Système Usuel*.

(3) The British *Système Usuel* to be an integral factor of the British decimal system, and as such to be respected wherever the latter is employed. The extent of use of the British standard units, the yard, the foot, the inch, the gallon, the pound-weight, and the bushel, to be determined in consultation between the countries affected, with (a necessary warning) due regard to British interests.

(4) The duodecimal scale of the tripod to be legalised in Britain and placed at the disposal of the international public as a fresh tool for the advancement of science.

(5) It be permissible to divide the pound sterling of British currency into 1,000 imaginary cents for all accounts and transactions as convenient and desirable, the matter being left entirely to individual preference. Sanction also to be accorded to the conversion of decimals into current coinage to the nearest farthing. Any difficulties which might arise would be confined to the payment of sums less than sixpence.

I consider that friendly metric countries should welcome the above as some return to the non-metric countries—Britain, the Dominions, the United States, Russia, India, and Japan—for their services in this war. An international recognition of the ancient Belgic yard would be a compliment which would gratify the whole world, except, of course, the powers which do not count.

I commend the above proposals, not only to the notice of the Decimal Association and the Board of Education, but also of the Board of Trade and other departments interested, and of all Chambers of Commerce. I am not afraid of criticism, so that it is fair, to the point, and lays all its cards on the table, as I have done.—Yours, &c.,

E. A. W. Phillips, M.Inst.C.E.

Hove.
May 8, 1917.

To the Editor of The Surveyor.

Sir,—Now that the London Chamber of Commerce, the Decimal Association, and kindred institutions, as well as individuals, have submitted their case for abolishing the existing British coinage, weights, and measures in favour of the metric or decimal system, we think it right to point out that there is a large body of responsible opinion which is strongly opposed to such a change, and for the following reasons:—

We do not contend that the maintenance of the existing British system does not involve certain disadvantages to the user, though they are almost entirely restricted to foreign commerce. These disadvantages, however, are mainly due to the fact that, in dealing with countries where the decimal or metric system is in force, difficulties have arisen in working the two systems in combination. These difficulties have been greatly exaggerated, and are for the most part of a purely arithmetical character, yet undoubtedly they exist, and it is by reason of them that a demand has arisen for some change which will avoid, or at least minimise, them.

Those who are in favour of such a change argue that the only possible course to adopt is to abolish by legislation the existing British standards, weights, and measures, and to substitute the metric or decimal

system, which, as should be well known, has its own inherent defects and limitations, even when compared with our own.

The difficulties involved in such a course are admitted to be great, even by those who advocate the change. The cost to the nation would be enormous, and, while involving all businesses, would benefit mainly the largest and those engaged in foreign trade. The time necessary to bring into operation so far-reaching a revolution would be considerable. On the conclusion of peace, trade, and especially foreign trade, will call for the highest energies of this country, and the nation which is most ready to resume foreign commerce will stand to gain proportionately. To select such a time as this for inaugurating so far-reaching a change, with its inevitable scrapping of our existing system of book-keeping, weights, and measures, would be an act of doubtful wisdom, even if the ultimate necessity could be proved up to the hilt, and there were no alternative course to adopt.

Fortunately for the interests of this country this is not the case, and it is possible at the same time to maintain our existing system, while bringing its use into harmony with the requirements of foreign trade, and at last enabling commercial men in this country to compete on equal terms with their Continental concurrents.

The adoption of such an alternative has been rendered possible by a simple and ingenious method, which enables anyone, in buying, selling, or cataloguing, to calculate British prices in any foreign currency, weight, or measure, or *vice versâ*, by the simple multiplication of the price by one factor. The principle applies to every calculation, no reference or knowledge of the difference in weights, measures, and currency being required. Moreover, it is equally applicable to every country in the world, so that foreigners can adopt it with equal facility. The necessary tables are being revised and checked for publication, and will be ready shortly.

It is impossible in so brief a summary to set out all the advantages of this method, but we would refer you to articles which appeared in the *Investor's Review* of February 17 and March 17, 1917, reprints of which may be obtained on application to us. We shall also be pleased to arrange, by appointment, for a short demonstration to anyone interested, and we undertake to prove our contention that this "simple method" meets all requirements for foreign trade in all parts of the world, both in buying and selling. It will be ready for immediate adoption, and, while bringing about a much needed and long deferred reform in our commercial relations, it dispenses with the necessity of scrapping our present system, with all the attendant loss, expenses, and dislocation of business involved. It is emphatically our conviction that this "simple method," when known and understood, will be welcomed as eagerly by men of affairs as Napier's Logarithms were three centuries ago by men of science.—Yours, &c.,

SCOTT ARMSTRONG & Co.

57 Moorgate-street, E.C. 2.
May 10, 1917.

REFUSE DESTRUCTOR COSTS.

To the Editor of THE SURVEYOR.

SIR,—I shall be glad if any of the readers of your valuable paper would be good enough to give particulars of costs, etc., of a destructor for a town with a population of about 10,000.

The present method of dealing with the house refuse is by tipping it on land near dwelling houses, the inhabitants of which complain of the nuisance it causes.

—Yours, &c., AMMAN.
May 14, 1917.

LAND FOR REFUSE TIPS.

To the Editor of THE SURVEYOR.

SIR,—My council have difficulty in securing land for refuse tips, and I shall take it as a favour if surveyors to councils who have taken land for this purpose (other than by agreement) would kindly communicate with me.—Yours, &c.,

J. R. LUPTON,
Surveyor, Lanchester Rural District Council.

Lanchester,
Co. Durham.
May 12, 1917.

WORLD'S HIGHEST CHIMNEY.

A 570-FT. REINFORCED CONCRETE SHAFT.

The highest chimney in the world is a reinforced-concrete chimney completed in January at Saganoseki, Japan. It is 570 ft. high, 42 ft. 8 in. outside diameter at the bottom and 26 ft. 3 in. inside diameter at the top, with a thickness of 29½ in. at the bottom and 7 in. at the top. It was designed (says *Engineering News-Record*) and built by the Weber Chimney Company, of Chicago, for the Oriental Compressol Company, of Japan, which has the general contract for the entire plant. The design includes provision for earthquake stresses.

The foundation is a huge block of monolithic concrete in the form of a truncated cone 17 ft. high, 95 ft. diameter on the base and 42 ft. at the top. The centre portion of the top is concave, with a bottom thickness of 7 ft. This foundation contains 2,711 cubic yards of concrete and required thirty days' work, day and night, for its construction. The pressure on the base is about 6,000 lb. per sq. ft., including allowance for wind pressure.

The steel reinforcement in the foundation and chimney amounts to 530 tons and consists of plain round and square bars of American make, purchased in Japan. In the lower portion of the chimney there are pairs of rings of ¾-in. square bars spaced 6 in. c. to c. vertically; at the upper portion there are single ⅝-in. rings spaced 7½ in. c. to c. One 5-ft. course at the base of the chimney contains as much concrete as would make a 6-ft. chimney 120 ft. high.

The lightning-rod protection is quite extensive. At the top is a copper circle with seven platinum points extending 4 ft. above the edge of the chimney. From this circle seven cables lead down the chimney. At a height of 400 ft. from the base is another copper circle, or circuit, with four platinum points, and from it four rods lead down to the base.

The concrete is made with Japanese portland cement of good quality. For the chimney the mix is 1:2½:4, using 1-in. stone. For the foundation the mix is 1:3:5, with 2-in. stone. The chimney was built in courses 5 ft. high. Two sets of movable forms were used, which allowed for leaving the forms in place twenty-four hours after the concrete was poured.

A 1-yd. Smith mixer was used, and a steam hoist for an elevator bucket in a wood tower built up inside the chimney. The Japanese authorities at first insisted that a complete outside scaffolding must be built, in accordance with local practice, but they were finally convinced that the other method was practicable. This effected an enormous saving in timber for the construction. There were eight Americans in charge of the work. Native labour was employed and was found to be cheap, but inefficient. All material was delivered by an aërial wire tramway 5,000 ft. long.

The chimney is on a hill about 430 ft. above sea level, the ground having a steep slope to the water. The smelter is on the water front, as all transportation is by water, there being no railway. The distance is 2,500 ft., and a reinforced-concrete smoke flue extends from the smelter to the chimney. The latter is of elliptical section, 30 ft. larger diameter, with a wall 8 in. thick. It is built on a zigzag line, so as to form a series of baffles to check the flow of gas and cause the dust to settle. A manhole and interior stairway provide access for collecting and removing the dust. The lower part of this flume is built in a trench cut to the required shape. At the base of the chimney is an opening 20 ft. wide and 31½ ft. high, from which a horizontal conduit 20 ft. long is built integrally with the chimney. The smoke flue is connected to this. The bottom of the opening is level with the top of the foundation.

Local Authorities and the Supply of Coal.—In the House of Commons on Monday a question was asked as to whether the Government intended to promote the necessary legislation which would enable local authorities to obtain a stock of coal in order to supply the poor people in their areas next winter. Mr. Roberts, who replied, said that, while the action of local authorities who had come to the assistance of coal merchants in an emergency was to be commended, the question as to how far it was desirable that they should undertake a definite responsibility for the supply of coal was at present the subject of inquiry by the Controller of Coal Mines, who proposed to discuss it with the Local Government Board at a later stage.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

In the April number of *Road Reinforcement* is there not an exceedingly interesting account of the struggle that went on in the eighteenth century as to whether weights of loads, width of tyres, &c., were to be restricted or the roads improved, and the futility of the legislation which ensued? Does not history repeat itself, and are there not still existing some legislators who would, if they had their will, issue some such similar instructions or laws, with the same futile result? Is it not evident that roads should be, and will have to be, made to carry the traffic, and not the vehicle constructed to suit the road?

. . .

Is it not sometimes satisfactory to feel that one has been a pioneer of a good movement? May the writer of these notes recall that towards the end of 1914 he put the following question: "In addition to the thousands of picks and wheelbarrows that, it is said, are to be sent from England at once [for use on the roads in France], would it not also be well to send about half-a-dozen civilian road experts as well to advise as to what should be done?" Instead of the six road experts thus suggested, have not the War Office recently sent Mr. Maybury and a large number of other road engineers to tackle the road problem at the front, and has not the result surpassed expectations? But why, oh, why was the War Office so long in deciding that this was the proper course to pursue?

. . . .

Should not every consideration be given to Sir Ashton Lister's recent letter in THE SURVEYOR with regard to the provision of light railways in this country? Is there any reason why there should not be a network of light railways alongside our roads, as suggested by Sir Ashton, which should not only act as feeders to the many railways, but also be the means of transportation between towns and villages, as well as collectors from scattered farms? Could not some of the numerous derelict canals be utilised for this purpose by draining them dry and using their beds as the foundation for the necessary rails? If such light railways are not constructed, are not our roads going to suffer considerably in the future from increased traffic?

. . . .

Will this country ever become "Imperial" in the best sense of the word so long as we read that at an electric generating station at Manchester the white men employed there were recently threatening a strike unless the five coloured men employed at the works were forthwith dismissed? When shall we be able to overcome the prejudice which some people have for so-called nigger workmen?

. . . .

Is there not some truth in the allegations against sanitarians that they are somewhat destructive in their operations? Do they not burn the valuable commodities deposited in our dust-bins, as well as waste much food, which might be utilised in other directions? Do they not clear insanitary areas of houses which might be furbished up and rendered temporarily inhabitable, and throw to waste the valuable nitrogen contained in our sewage? What is to be said in defence of sanitarians after this scathing indictment?

. . . .

As the question of the varying wages paid to road men and other municipal employees differs considerably in various parts of the country, and is a source of grievance and endless worry, would it not be well if some representative influential committee could be formed to deal with the matter and endeavour to suggest a remedy?

. . . .

Does it not redound to the credit of our engineers in India when we read that whereas in the year 1892 in the Punjab there were nearly 11,000,000 acres of land under irrigation, there are now more than 17,000,000 acres of such land? When we reflect that the greater part of this land was formerly arid waste, where nothing would grow, and that this huge area is now capable of bearing crops of every description, can we not truthfully say that the engineer is the pioneer of civilisation, and that without his efforts in the past we would be still cave dwellers without any of the luxuries and comforts which we now enjoy?

FAILURES OF BITUMINOUS SURFACES.*

By ARTHUR H. BLANCHARD, M.CAN.SOC.C.E., New York.

The causes of failure of bituminous surfaces are numerous. They may be considered from the standpoint of the condition and character of the original surface, the material used, the method of construction, and local conditions.

The failure of bituminous surfaces from the standpoint of the character of the original surface is many times due to failure on the part of those in charge to place the surface in satisfactory condition before the application of the bituminous material. Many cases are noted where bituminous materials are applied over a surface in which are found many pot-holes and ruts, or which is dirty, due either to accumulated dust and dirt or to the original method of construction. In many cases a damp condition of the surface has resulted in failure.

From the standpoint of the physical and chemical properties of the material, many instances may be cited in which failure is due to materials not having the proper charactertistics for the conditions under which they are employed. The large percentage of volatile constituents contained in certain asphaltic oils has rendered surfaces constructed with them unsatisfactory, because of the long period required for these surfaces to set up, so that the bituminous material will not track, or the carpet thus formed will not creep and form waves and humps. In certain cases the use of light oils on tar or asphalt surfaces has softened the original bituminous surface to such an extent as to render the road or pavement unsatisfactory for use.

From the standpoint of construction, failures are due both to the use of too small an amount of the bituminous material and to an excess of material. Improper application, resulting in uneven distribution, is accountable for many failures of bituminous surfaces, while in other cases a lack of sufficient covering of stone chips or material of a similar character has rendered the surface sticky and mushy.

There are numerous instances where bituminous surfaces have been adopted under conditions which call for the construction of bituminous concrete pavements, or even some type of block pavements. A mat type of construction, which has been employed to a considerable extent, has proved inefficacious in cases where the amount of motor-car traffic was not sufficient to iron out satisfactorily the chalk-holes caused by the horse-drawn vehicle traffic.

A SURREY ROAD-MAKING EXPERIMENT.

TESTS OF KENTISH RAGSTONE TAR-MACADAM.

At the last meeting of the Godstone, Surrey, Rural District Council, Mr. G. E. Crowter, the highways surveyor to that authority, presented a report upon experimental lengths of roads at Warlingham, Chelsham, Lingfield, and Limpsfield, re-surfaced with Kentish rag stone tar-macadam about five years ago. Mr. Crowter stated that the total area dealt with was 7,145 superficial yards, or nine-tenths of a mile. The experiment was to be for a period of ten years, and only five years had elapsed. The amount spent on repairs was nominally £20. He estimated that on the former road construction they would have had to expend £2,550 in ten years for reconstruction and repairs, but with the present system it would not exceed £1,526, thereby effecting a saving of £1,024, or £102 per annum on the nine-tenths of a mile. He would not say that this particular kind of tar-macadam would be successful in all localities, because on the length of Godstone road where it was tried it was a complete failure. Doubtless in the long run this system would save the ratepayers a considerable sum of money, as the advantages of the tar-macadam were unquestionable. He felt that the money spent by the council had been fully justified by the result. The length of road at Chelsham would probably last fifteen years.

* Extract from paper presented before the Fourth Canadian and International Good Roads Congress at Ottawa.

Law Notes.

Edited by J. B. REIGNIER CONDER, Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

Housing and Town Planning Act, 1909: Demolition Orders: Undertaking to Repair.—An important point under sec. 18, sub-sec. 3, of the Housing and Town Planning Act, 1909, was decided in *Broadbent* v. *Rotherham Corporation*. (Chancery Division; Mr. Justice Astbury; April 19th.)—The plaintiff was the owner of certain houses in respect of which the corporation had made closing orders, as being unfit for human habitation, under sec. 17 of the Act. These orders were confirmed by the Local Government Board, on appeal, in July, 1914; and in May, 1915, demolition orders were made, under sec. 18. The plaintiff then applied to the corporation to postpone the operation of the demolition orders, stating that she was prepared to put the property in order, that her architect had gone into the matter, and her builder had been instructed to prepare specifications, and tender for the work, which would be started forthwith; and at the same time asking the corporation to state if they accepted the specifications when received, and to allow their officer of health to meet her architect on the premises. The corporation, however, were advised by that officer that the houses were incapable of being made fit for human habitation, and they therefore refused the application, without giving the plaintiff an opportunity of submitting specifications, or allowing her architect to meet their officer. The plaintiff then brought this action, claiming an injunction to restrain the corporation from proceeding to enforce or carry out the demolition orders until they had "heard and determined the application according to law." Mr. Justice Astbury granted the injunction asked for. He said that, inasmuch as the corporation had refused the plaintiff's application without giving her an opportunity of presenting her case, or considering her plans and specifications, and had merely decided *ex parte* that the houses were incapable of being made fit for human habitation, there had been no proper exercise of their discretion under section 18, sub-section 3.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as* noms de plume. *The letter* X, *combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.

New Street: Cul-de-sac: Gates.—"Cul-de-sac" writes:—Between five and six years ago the owner of a building estate deposited plans with the council for the laying out of a new street, running north and south, and having an outlet at the south end into an old highway, but having no outlet at the north end. The plans were approved, and the street was constructed, and made up by the owner to the satisfaction of the council, but it has never been adopted. The land on the east side of the street was laid out in building plots, all of which, except the two northernmost plots, have been sold, and houses have been erected thereon. Right of way over the street were granted to the purchasers of the plots, and, being a cul-de-sac, it has practically been used only by the occupiers of the houses and their servants, friends, tradesmen, &c., as a means of access thereto, and not by the public generally. The owner now desires to erect a fence and gates across the north end of the street, in a line with the southern boundary of the two end plots, thus enclosing the northern end of the street. I shall be glad if you will advise me whether the council can prevent him from doing so.

In my opinion it is very doubtful whether the council have power to prevent this. The facts, or so far as stated in the query, appear to be very similar to those in the case of *Kirby* v. *Paignton Urban District Council* (77 J.P., 169), in which it was held, on the evidence, that the new street had not become a public highway, but was a private road.

Timber and Stone Hauling on the Highways.—"J. E. H." writes:—In this district great damage is being done to the roads by the haulage of timber intended for use as pit props. Does this come within the definition of national service, and can the cost of repairing the damage done to the road be recovered from the Road Board or other authority? Considerable damage has also been done to the roads by hauling stone for the building of a munition factory. Can the cost of repairing these roads be recovered from the same authority? I would refer you to a statement made in the House of Commons and reported in The Surveyor of March 30th of this year.

If the surveyor gives a certificate, under sec. 23 of the Highways and Locomotives (Amendment) Act, 1878, stating that, having regard to the average expense of repairing highways in the neighbourhood, extraordinary expenses have been incurred in repairing the damaged roads, by reason of the damage caused by the traffic in question, such expenses could, in my opinion, be recovered from the authority by or in consequence of whose order such traffic was conducted, irrespective of the question whether it is "national service," or whether the material hauled is timber or stone. The statement by Mr. Hayes Fisher in the House of Commons, to which my correspondent refers, appears to relate to some arrangement between the Road Board and the Home-grown Timber Committee, with a view to the repair and improvement of roads over which timber has been or is likely to be hauled, apart from any question of legal liability.

Municipal Tramway: Accident to Passenger: Liability.—"C. T. A." writes:—The corporation tramways are worked by overhead electric traction. A car was passing one of the standards when by some means the wheel at the bend of the trolley arm became detached from the electric wire, with the result that the trolly arm was plucked away from the standard at its socket, and fell upon one of the outside passengers, severely injuring him. The system of traction is quite up to date, and the one most widely used, and the apparatus on the car was in perfect working order at the time of the accident. Will you please advise me whether the injured passenger can recover damages from the corporation. The tramway has been working for several years, and this is the first accident that has occurred.

In the absence of any actual negligence, conducing to the accident on the part of any of the employees of the corporation, I do not think they are liable. See *Newberry* v. *Bristol Tramways and Carriage Company, Limited* (11 L.G.R., 69).

Repair of Footpath.—"S. A." writes: My council have been asked to repair a footpath, which is situate in the centre of a village; the path is in some parts 44 ft. distant from the metalled edge of the highway, the intervening space being an "open green." I have always contended that as this path does not run alongside the highway it is not repairable by the rural district council, but by the parish council, as the rural district council have not, to my knowledge, repaired it in the past. Is there any distance a footpath must be from the metalled road to bring it within the definition "alongside a highway"?

The liability to repair a footpath does not depend upon its being alongside a highway, except to this extent, that, under sec. 13 (2) of the Local Government Act, 1894, a parish council *may* undertake the repair of public footpaths "not being footpaths at the side of a public road"; but the section expressly provides that this power shall not relieve any other authority from any liability with respect to such repair. I am not aware of any ruling as to the interpretation of the phrase "not being footpaths at the side of a public road."

British Roads in Salonika.—An officer with the British Army in Salonika, writing to a relative in Bristol, says: "We have had to make roads and railways as required, and they always seem to be in demand. The country will have quite a good system of roads when we have finished with it. I lay claim to know a little about the subject, having worked on roads for months. It is pretty hard work, too."

THE TRIBUNALS.

At the Brighton Tribunal recently applications were heard by the military representative for the review of certificates of conditional exemption without limit of time which had been granted by the Tribunal in July, 1916.

The exemptions granted to thirty-eight men employed by the Brighton Corporation tramways came under review. Sir John Blaker, military representative, said he had had an opportunity of discussing the matter with Mr. Marsh, the tramways manager, who had worked out a very fair and a very ingenious scheme, and, subject to the approval of the tribunal, he was prepared to accept it.

Mr. Marsh said the scheme, which had been approved by the Tramways Committee, provided that ten men should join up by instalments until the end of July, the remainder being given periods of exemption. The principle of the scheme was that they should start on the man's actual age, adding one year for each child and add to that one-third of his period of service. That gave the man a fictitious age, the idea being that the youngest men should go first. He had anticipated a review of the exemptions some time ago, and had accordingly prepared the scheme which he now submitted.

The tribunal decided (the *Sussex Daily News* reports) that the existing certificates should be withdrawn, and that A and B1 men should be given three months and the remainder six months.

With respect to eight men employed at the corporation dust destructor, the borough surveyor (Mr. H. Tidstone) said these men were engaged day and night, and it was impossible to find substitutes for them.

The certificates were withdrawn. The tribunal granted one month final to the men classified A, three months to the B1 men, and six months to those passed C2.

In the case of an engineer and disinfector at the sanatorium (40, B1), six months' exemption granted.

At the Sowerby Tribunal lately the case of the surveyor to the Sowerby Urban District Council, Mr. John Smith, was brought up for review, at the instance of the military representative, who (the *Halifax Daily Guardian* reports) appealed against the recent decision of the tribunal in granting him conditional exemption.

The military representative pointed out that he was being pressed by the military authorities for more men. Mr. Smith no doubt was indispensable so far as the district council was concerned, but on the other hand he was not so in the opinion of others. As far as the accounts went, and the supervision of the men, this work no doubt could be done by others. There had been a similar case at Barkisland, where the surveyor had other duties to perform, such as collecting rates, registration work, &c. His case was heard before the Appeals Tribunal of Halifax, and was refused. On inquiry on the previous day as to how they were going on up at Barkisland, he was informed that the surveyor had joined up, and that suitable arrangements had been made. He suggested that Mr. Smith was indispensable.

Mr. Edgar Booth (clerk to the council), on behalf of the surveyor, said that the Barkisland case, in his opinion, had no bearing at all on the present case. There had been no change since they were before the tribunal on the last occasion, neither had there been any diminution in the surveyor's duties. On the other hand, these had increased through the Government wanting returns of cattle, &c., in the district. He was also connected with the local savings bank, allotments, and was a member of the Volunteer Training Corps. The sanitary work was most important from a national point of view as regards the inhabitants of the district, numbering some 3,000. The opinion of the council, who were the guardians of the health of the district, was that Mr. Smith was the only one and permanent servant in the district. To secure a [illegible] at home was just as important a work as was the cultivating of food and the export of munitions.

The tribunal withdrew the certificate of conditional exemption and granted the surveyor temporary exemption to August 1st.

At the Leeds Tribunal last week a civil engineer and surveyor employed by the East Sussex County Council, who had been granted exemption in order to do certain work in connection with the Lewes to Newhaven road, attended on account of the military having asked for the withdrawal of the certificate as he had been passed for general service.—Mr. F. J. Wood, county surveyor, said the council felt justified in putting forward the claim that the man should be retained on account of the great importance of his work. In reply to the military representative, Mr. Wood said he had tried to get a substitute for the man from the Road Board, but without success. The man in question came from the London County Council's employ in 1915, in order to do the work on the Lewes to Newhaven road. By the Chairman: If this man had to go he would have to tell the Government the work must stop.—After giving the case their consideration the tribunal allowed the claim of the military.

A military appeal against conditional exemption granted to Mr. J. Johnson (35), general service, highways surveyor to Keynsham Rural District Council, was dismissed at the Somerset Appeal Tribunal at Bath on Saturday.

SURVEYORS' INSTITUTION.

PROFESSIONAL EXAMINATIONS, 1917.

The following students have been successful in passing the intermediate examination: Messrs. C. Burkitt, Barnsbury, N.; N. H. N. Darby, Newton Abbot; G. F. Edwards, Shrewsbury; A. C. Golding, Reading (special prize); A. H. Halls, Chelmsford (institution prize); H. H. Ingleby, Little Clacton; C. Kennard, Redhill; and V. R. Westrope, Ashwell (near Baldock), Herts.

The following non-students have been successful in passing the intermediate examination: Messrs. C. A. Ash, Crouch-end, N.; W. G. A. Clark, Loftus; H. Colbeck, A.R.I.B.A., Ealing, W. (Building Prize); C. H. R. Davis, Bournemouth; S. Evans, Burry Port; W. H. Forder, Ware (Beadel Prize); R. Jackson, Preston; J. Lowe, Wigan; R. A. Mitchell, Belfast; R. G. H. Newbigging, Ledbury; J. O. Parry, Ammanford (Penfold Silver Medal and Driver Prize); B. G. Robinson, Smethwick; H. C. Rudkin, Grantham; A. E. Shaw, Halesowen; L. J. Taylor, Rowley Regis; T. P. Tinsley, Parson's-green, S.W.; N. Wailes, Bedford; and D. Warder, New Cross, S.E.

The following candidates have been successful in passing the final examination: Messrs. T. Adam, Lockerbie; G. H. Allison, Grimsby (Quantities Prize); W. W. Berry, Kingston Hill (Galsworthy Prize and Mellersh Prize); G. G. Bourne, Burton-on-Trent; E. S. Driver, London, S.E.; R. Edwards, Oswestry; O. G. Else, Newark; T. P. Francis, Pontardawe; J. W. Geddes, Partick; D. Griffiths, Pontypool; W. Keay, Leicester; E. S. Purry, Hampstead, N.W.; E. J. Rees, Neath; J. S. Rutherford, Newbury; D. C. W. Sanders (2nd Lieut., R.F.A.), Vaud, Switzerland; C. H. Wastell, Swansea; J. C. Wheeler, Alford, Lincs (Penfold Gold Medal); F. Willey, Durham; G. Williams, Devynock, Breconshire; and J. H. Wilson, Blackburn (Crawter Prize).

The following candidates have been successful in passing the Direct Fellowship Examination: Messrs. F. P. Dolamore, Bournemouth; F. T. Howes, Gloucester; N. D. Sheffield, London Bridge, S.E.; A. L. Thomas, Pontypridd; and D. J. Williams, Gam Dolbenmaen, Carnarvonshire.

"B.R.C."—We have received from the British Reinforced Concrete Engineering Company, Limited, of 1, Dickinson-street, Manchester, a copy of a tastefully-bound and well-printed booklet containing reproductions of nearly 150 photographs illustrative of work constructed entirely, or in part, of "B.R.C." reinforced concrete. Views of the majority of recent constructions embodying munition factories and military works are of necessity omitted, but the selection which has been made amply suffices to indicate the astonishing variety of the undertakings into which the company's system has been introduced. Reservoirs, river coverings, locks, sewage and water tanks, seawalls and bridges are among the structures illustrated. A few examples of road work are also shown; a separate booklet, however, has been issued dealing with this special branch of the firm's activities.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Brandon and Byshottles U.D.C.—The surveyor, Mr. G. G. Donkin, is preparing amended plans for a new isolation hospital.

Herts C.C.—It has been agreed to carry out repairs and other works at the Hill End asylum, at an estimated cost of £1,500.

Louth T.C.—The borough surveyor, Mr. G. H. Allison, has been asked to prepare an estimate of the cost of converting part of the town hall buildings into a public mortuary.

Sowerby Bridge U.D.C.—The reconstruction of the swimming baths is being considered by the council.

Worthing T.C.—The question of the purchase of the pier by the corporation has been raised in connection with a scheme for the erection of a new pavilion at the shore end, and the improvement of the approach to the pier.

HOUSING AND TOWN PLANNING.

Ayr T.C.—The burgh surveyor, Mr. J. Young, has been instructed to prepare plans for the erection of houses on ground belonging to the corporation at George's-avenue so that the council might be in a position to proceed with the building of the houses after the war should that be deemed necessary and advisable.

Loughborough T.C.—A sub-committee has been appointed for the purpose of preparing a town-planning scheme.

Sunderland T.C.—The borough surveyor, Mr. J. W. Moncur, has prepared a report on the housing of the borough, which shows that while 951 families (nearly 5,000 persons at an average of five persons per family) have been displaced by the demolition of and alterations to houses in the town since 1910, only 289 families (about 1,500 persons) have been accommodated by the erection of new dwellings since the same year. This means that there is less housing accommodation in Sunderland at the present time than there was seven years ago—and this in spite of the increase in population consequent upon births and the influx of workers to the town that has followed the expansion of the industries of the district during the year.

Tiverton T.C.—The council have decided to make a representation to the Association of Municipal Corporations, with a view to joint action with other authorities with reference to the heavy burden cast on housing schemes by the incidence of the property tax of 5s. in the £ charged on municipal housing schemes.

Wombwell U.D.C.—The council have resolved to enter into negotiations for the acquisition of various sites for the purpose of housing schemes.

MOTOR TRANSPORT.

Accrington T.C.—The corporation have purchased for £1,000 an electric motor wagon for the removal of refuse to the destructor, and it is expected to yield a saving of from 10 to 15 per cent. The wagon is driven from Edison storage batteries, and it is stated that this is the first vehicle of the kind that has been tried in Lancashire for refuse removal.

Bournemouth T.C.—The chief of the fire brigade states that there have been delays in answering fire calls owing to the scarcity of horses, and that this condition must continue until the town council are authorised to purchase motors.

Hereford T.C.—The Watch Committee are considering the question of the provision of a motor fire-engine.

Jarrow T.C.—The Stables Committee have been asked to consider the question of the purchase of a motor sweeping-machine.

Plymouth T.C.—The Watch Committee have agreed to purchase a petrol motor fire engine.

REFUSE COLLECTION AND DISPOSAL.

Shipley U.D.C.—The council have notified that receptacles for waste food may be obtained at cost price from the sanitary department. The materials, consisting of the refuse from greengrocers' shops, skins and parings of fruit and vegetables, and cabbage leaves, are collected and sold to local pig dealers and feeders. The sanitary department also undertake to collect bottles, jars and old metals. The development of the scheme on the waste food side has been the means of raising a fairly substantial amount of money for the relief of the rates.

ROADS AND MATERIALS.

East Grinstead R.D.C.—The Road Board have sanctioned a grant of £464 for further works of road improvement at a local camp. The council are making a claim upon the War Office for compensation for extraordinary traffic by haulage of timber

Hetton U.D.C.—The surveyor, Mr. J. Harding, has received instructions to proceed with the work of road improvement at Coal Bank.

Lathom and Burscough U.D.C.—An arrangement has been made with the county council for the conversion by the urban council of Liverpool-road from water-bound macadam to tar macadam, at an estimated cost of £1,493, and for similar work in Wigan-road, at a cost of £290.

North Riding (Yorks) C.C.—With regard to the extraordinary traffic on the roads the Highways and Bridges Committee reported that, whilst they did not recommend that any action should be taken in war time, they had directed the clerk to draw the attention of the County Councils Association to the matter with a view to some concerted action being taken throughout the country for the purpose of relieving the rates, if possible, of the extraordinary expenditure caused by the heavy traffic in the district in connection with the agricultural industry, and also of the expenditure entailed by the additional heavy motor traffic for Army and Navy purposes, and by the great amount of timber leading. The committee were of opinion that the Government should, after the war, afford the counties considerable relief by making grants towards the reinstatement of the roads now being damaged.

Salop C.C.—An intimation has been received from the Road Board that they will be prepared to make grants to the county council aggregating £2,200 for tar-macadamising and tar-painting improvements on the rural main roads.

Tiverton R.D.C.—It was reported that timber haulage had caused damage to roads to the extent of £875. Application is to be made to the hauliers concerned for compensation.

Uckfield R.D.C.—An agreement has been reached with the Road Board for the repair of certain roads at Crowborough, it being suggested on behalf of the board that tarred macadam should be used instead of granite, which was difficult to obtain.

SEWERAGE AND SEWAGE DISPOSAL.

Aldershot U.D.C.—The council have confirmed the recommendation of the Works Committee to instal, at an estimated cost of £230, an electrically-driven pump at the sewage disposal works, to assist the existing gas engines. The surveyor, Mr. J. E. Hargreaves, stated that the works were dealing with as much sewage from certain barracks and hutments as they were from the whole of the civilian portion of South Farnborough before the war.

Henley (Oxon) R.D.C.—The council have submitted to the Local Government Board a scheme for improved sewerage and the provision of new pumping plant. The board have sanctioned a loan for the new sewers, but have disallowed the purchase of pumping plant, and work will be commenced as soon as practicable on the sewerage scheme.

Woking U.D.C.—The Local Government Board have asked the council to submit details of their scheme for the sewerage of Sutton and Bridley, at an estimated cost of £14,000, in order that the sanction may be expedited when the restrictions upon loans are withdrawn.

WATER, GAS, AND ELECTRICITY.

Birkenhead T.C.—It is reported that the Crosshill reservoir at Thingwall, the first portion of the new water undertakings for the borough, is approaching completion. The rest of the work, including the dam in the mountains at Denbighshire, has been postponed by the war.

Egremont U.D.C.—A scheme has been adopted with the object of doubling the storage capacity of the gas-works and providing an exhauster and an additional gas engine.

Ipswich T.C.—It was reported that the electric-power station could not supply any more power, the Electricity Committee having contracted for the full output of power with the available machinery. An appeal to the Local Government Board for authority to purchase new machinery had failed.

Luton T.C.—The electrical engineer reports that it will be necessary to lay down additional electric mains to meet the requirements of a number of large factories.

Penzance T.C.—The deputy surveyor, Mr. H. Marden, has prepared a scheme for the improvement of the water supply, which the Water Committee are considering in detail.

Walsall T.C.—The Electric Supply Committee recommend certain extensions to the electric mains.

MISCELLANEOUS.

Deptford B.C.—It has been agreed to lease four railway arches, for the purpose of a municipal piggery. The cost of the initial work and plant is estimated at £75.

Nottingham Corporation Farming Profit.—A profit of £8,887 was obtained by the Corporation of Nottingham from the working of Stoke Farm last year.

Timber Supplies.—It was stated in the House of Commons on Monday, in answer to a question, that it was not proposed at present to fix maximum prices for home-grown timber.

"Rum Rations" for Sewage Works Employees.—Stanhope (Durham) Urban Council's workmen jointly applied for an extra allowance to provide them with "something to take" before cleaning out the sewage tanks. The council complied with the request, which a member humorously interpreted as a desire for a "rum ration."

Architects and Town-Planning Schemes.—A deputation from the Birmingham Architectural Association has attended before the Birmingham Town Planning Committee with a proposal to render assistance to the city council in the preparation of town-planning schemes. It was pointed out that on the Continent and in America architects were always consulted by the local authorities when town-planning schemes and city developments were under consideration, and that there were three kinds of work in regard to which the profession could render assistance—viz., town planning in the suburbs, reconstruction in the centre of the city, and housing. At present architects were only able to come in and criticise a scheme when most of the work had been done. They asked that, if possible, the members of the profession should be consulted at an earlier stage, and said they would give any help they possibly could. It was understood that the suggestions would be carefully considered and reported on later.

Pooling Road Work in the West Riding.—A conference was convened recently by the Wharfedale Rural District Council to consider a suggestion by the West Riding (Yorks) county surveyor, Mr. F. G. Carpenter, that the labour in connection with the local roads should be pooled in order to facilitate the work of maintenance. The conference negatived, by a very large majority, a resolution in favour of any pooling of labour or amalgamation of staffs. The expediency and feasibility of mutual help was, however, fully recognised by the conference, and a resolution was unanimously passed for the establishment of an exchange (to be held open at the office of the Wharfedale Rural Council at Otley) for the purpose of ascertaining which councils can give, or are in need of, assistance in executing main road repairs, and in arranging for an interchange of labour, equipment, and materials as occasion may require and opportunity serve.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Birmingham (May 8th. Mr. G. L. Pepler).—Certain proposed amendments to the East Birmingham town-planning scheme were submitted for consideration at this inquiry. The object of the amendments is to secure direct links with the North Yardley area by diverting two roads and constructing an additional road.—The city surveyor (Mr. H. E. Stilgoe) said that since the East Birmingham scheme was prepared it was thought that the roads in their original position would fit in with the planning of the North Yardley area, but when this came to be thoroughly considered it was thought that it would be better to effect certain diversions.

Scarborough T.C. (May 15th. Mr. P. M. Crosthwaite).—£12,700 for constructional, drainage and road works. With respect to the proposed construction of a toe and apron at the Royal Albert-drive, the town clerk, Mr. Sydney Jones, explained that several gales had breached the wall at the portion where the old pier formerly stood. The foundations of the wall were also found to be weak, and the council had to apply for further sums to carry out protective work. The borough engineer (Mr. W. H. Smith) said his investigations had shown that in some places there was a loss of nearly 10 ft. to the sea bed. The scour was very serious, not only at the base of the wall, but seaward at least 200 ft. The inroads on the shale was causing the wall to creep forward, and it was in a very dangerous state.

LOANS SANCTIONED.

Ayr T.C.—£10,000, supplemental loan for the execution of electricity works.

Grimsby R.D.C.—£1,142 for road improvement at Immingham.

Cowes U.D.C.—£3,000 for the gas undertaking.

Business Announcements.—Messrs. Braithwaite & Kirk, engineers, of 117, Victoria-street, S.W., and Crown Bridge Works, West Bromwich, and Neptune Works, Newport, Mon., inform us that as Mr. A. E. G. Braithwaite is retiring from business on the ground of ill-health, the partnership has been dissolved, and the business will be carried on as Braithwaite and Co., the partners being Messrs. J. H. Humphreys and A. Anderson.

FOR OTHER ADVERTISEMENTS
See End of Paper.

SHEERNESS URBAN DISTRICT COUNCIL.
APPOINTMENT OF SURVEYOR AND ENGINEER.

The Council invite applications for the position of Surveyor and Chief Engineer for their District which has an area of 840 acres or thereabouts, and a population estimated at 20,000. Candidates must be fully qualified to perform the ordinary duties attaching to such an office, and also to take the oversight of the Waterworks undertaking (the supply being from deep-well borings by means of air-lift ram pumps).

He must also have a competent knowledge of Sea Defences and Pier Maintenance Works.

The person to be appointed will be required to reside within the district, and devote the whole of his time to the duties of the office, and will not be allowed to engage in private practice.

Commencing salary will be at the rate of £300 per annum, rising by annual increments of £20 to £400 per annum.

Applications, stating age, qualifications, and experience, accompanied by copies of not more than three recent testimonials, and endorsed "Surveyor and Engineer," should be sent to the undersigned not later than Saturday, the ninth day of June, 1917.

(By order of the Council)

VINCENT H. STALLON,
Clerk.

Council Offices,
Sheerness.
May 16, 1917. (3,417)

PERSONAL.

Mr. T. F. Berry, surveyor to the Sheerness Urban District Council, has resigned owing to ill-health and advancing years.

Mr. H. J. Kilford, borough surveyor of Ilkeston, has been elected a member of the Institution of Municipal and County Engineers.

Mr. W. C. Hunt has been appointed temporary assistant surveyor and inspector of nuisances to the Uckfield Urban District Council.

Mr. H. M. Bennett, sanitary surveyor to the Warmley Rural District Council, who is 48, has volunteered for service under the extended age limit.

Mr. A. H. Quick, engineers' department, London County Council, has been transferred to the class of member of the Institution of Municipal and County Engineers.

Mr. W. B. Acton, superintendent of Conservancy, Kisumu, East Africa, has been transferred to the class of member of the Institution of Municipal and County Engineers.

Mr. G. I. S. Marsh, of Croydon, has been appointed temporary building surveyor and inspector of nuisances to the Battle Rural District Council at a salary of £125 per annum.

Mr. J. W. Emmott, assistant surveyor to the Pontefract Rural District Council, has been appointed surveyor to the Leyburn Rural District Council at a salary of £120 a year.

Mr. Gerald W. Lacey, elder son of Mr. G. William Lacey, borough engineer and surveyor of Oswestry, has been gazetted Second Lieutenant in the Northumberland Fusiliers, Special Reserve of Officers. Lieutenant Lacey enlisted in the Royal Welsh Fusiliers in May, 1915, being then under eighteen years of age, and saw seven and a half months' service in France, and was wounded on the Somme in July last year. He recently passed through a course of training in the Officers' Cadet School at Lichfield.

Mr. C. Vawser, temporary borough surveyor of Ripon, has been appointed surveyor to the Luddenden Urban District Council, in succession to Mr. F. Clayton, who has been appointed surveyor at Burley-in-Wharfedale. The Luddenden Council have passed a resolution expressing sincere appreciation of the services of Mr. Clayton during the past nine years. During the whole of this time (the resolution states) Mr. Clayton has most efficiently and effectively carried out the duties appertaining to the office of surveyor and nuisance inspector to the entire satisfaction of the council.

Captain John Nelson Prior, upon whom has been conferred the Military Cross, is sanitary surveyor to the Sevenoaks Rural District Council, with which body he has been associated for more than eleven years. In May, 1915, he offered his services to the War Office, and in August of that year was posted to the 5th Labour Battalion, Royal Engineers, and crossed to France immediately. For the first eight months he was engaged on roads, bridges, and quarrying, and subsequently on railways behind the firing line, frequently under heavy shell fire. Colonel Williams, in announcing at a council meeting the distinction that had been conferred upon their officer, moved a resolution of congratulation, which was seconded by Colonel Rogers, and carried with acclamation. Captain Prior is a member of the Institution of Municipal Engineers.

OBITUARY.

Mr. Bryce W. McCall, Brockneil, Girvan, a former road surveyor at Carrick, died recently, we regret to state. He retired in 1910 owing to failing health.

The death is announced at North Berwick, at the age of 68, of Mr. Benjamin Hall Blyth, who was president of the Institution of Civil Engineers in 1914, and was associated with many of the most important engineering works carried out in Scotland during the last half-century.

Mr. William Goldstraw, formerly city building surveyor under the Liverpool Corporation, died last week at the age of seventy-two. He was the author of a "Manual of Building Regulations," in which he collected, condensed, and annotated the requirements contained in various Acts of Parliament relating to building.

KILLED IN ACTION.

Second-Lieutenant Clifford M. Coates, R.G.A., who has been killed in action, was, before joining the Army in January, 1915, engaged in the surveyor's department of the Pontypridd Urban District Council.

CARDIFF WATER SUPPLY.

PROPOSED SECOND PIPE LINE FROM BRECONSHIRE.

At their meeting on Monday, the corporation of the city of Cardiff confirmed a resolution of the Waterworks Committee to proceed with the necessary steps for obtaining Parliamentary powers for the construction of a second pipe line of the Taff Fawr conduit from the impounding reservoirs in Breconshire to the storage reservoirs near Cardiff, the preliminary estimate for the work being £235,000, and that the waterworks engineer (Mr. C. H. Priestley, M.INST.C.E.) act as engineer-in-chief of the corporation for the construction of the proposed line, and all matters in connection therewith.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Edward Whitwell, F.I.S.E., M.S.A., Engineer and Surveyor, Abersychan Urban District Council.

GENERAL MEETING IN LONDON.

A general meeting will be held in London, at No. 4, Southampton-row, W.C. 1, on Wednesday, June 6th, at 6.30, when a paper, "House Refuse: Its Calorific Value and its Possibilities," will be presented for discussion by Mr. Reginald Brown, M.INST.C.E., M.I.MECH.E., F.S.I., F.R.SAN.I., &c.

The chair will be taken at 6.30 by Mr. Henry C. Adams, M.INST.C.E., M.I.MECH.E., F.R.SAN.I., the Acting President of the Institution.

INSTITUTION OF WATER ENGINEERS.

SUMMER MEETING.

The annual summer meeting of the Institution of Water Engineers will be held in London on Friday, June 22nd, commencing at 2.15 p.m.

A paper entitled "Colour Records Applied to Potable Waters" will be presented by Mr. J. S. Pickering, M.INST.C.E., of Cheltenham (past president), and a discussion on "Water Supplies as Sources of Power" will be introduced by Mr. Cecil H. Roberts, M.INST.C.E., of Aberdeen (member of the council). The premiums awarded by the council for papers read during the year 1916 will be presented to the respective authors, and the president will read a short report on the past year's working.

London County Council's Tramway Purchase.—Terms have now been agreed upon for the purchase by the London County Council of the portion of the undertaking of the London United Tramways (Ltd.) within the county area. The lines affected, which are situated in the borough of Hammersmith, are about 5½ route miles in length, and are worked on the overhead trolley system of electric traction. They include the London termini at Hammersmith-broadway and at Shepherd's Bush-green of the system worked by the company, which extends to Hampton Court, Hounslow, and other points in Middlesex. The agreement includes provision for running arrangements between the council and the company; for the transfer to the council of the Chiswick power station and plant, and for the supply by the company of power for the running of cars on the purchased lines for twenty-one years free of cost. Including the purchase price (£235,000) and costs and expenditure on reconstruction work, the capital outlay will amount to £320,899. It is estimated that there will be, as regards the lines to be purchased, an annual surplus on working of £22,917 after providing for renewals, but exclusive of power and debt charges. The total debt charges in the first year will be about £26,870, decreasing annually by about £545.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but these responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ASSISTANT SURVEYOR.—May 21st.—Dorset County Council. £150 per annum, with travelling expenses.—Mr. E. Archdale Ffooks, clerk, county [illegible], Dorchester.

TEMPORARY ARCHITECTURAL ASSISTANT.—May 21st.—Barrowby Urban District Council. £130 a year.—Mr. T. J. Thomas, clerk, Council Offices, Barrowby.

TEMPORARY SURVEYING ASSISTANT (town planning).—May 22nd.—Corporation of Birmingham. £3 3s. per week.—Mr. Henry E. Stilgoe, city engineer and surveyor, The Council House, Birmingham.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 2nd.—Eton Urban District Council. £150 a year.—Mr. J. E. Gale, 3, Sheet-street, Windsor.

ROAD FOREMAN.—June 4th.—Hendon Urban District Council. £3 10s. per week.—Engineer and Surveyor, Council Offices, Hendon, N.W.

SEWAGE WORKS FOREMAN.—June 4th.—Corporation of Halifax.—Borough Engineer, Town Hall, Halifax.

SURVEYOR AND ENGINEER.—June 9th.—Sheerness Urban District Council. £300—£400 a year.—Mr. Vincent H. Stallon, clerk, Council Offices, Sheerness.

STEAM ROLLER DRIVER.—Corporation of Oswestry.—Mr. G. William Lacey, borough engineer, Oswestry.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

MERTHYR.—May 22nd.—For the erection of a covered way at a sanatorium, for the board of guardians.—Mr. Thomas Roderick, architect, Ashbrook House, Aberdare.

ST. HELENS.—May 30th.—For the erection of a boiler house and other works at a power station, for the Electricity Committee.—Mr. E. M. Hollingsworth, borough electrical engineer, St. Helens, Lancs.

Engineering: Iron and Steel.

WARRINGTON.—May 22nd.—For the supply of mechanical stoker, for the Electricity and Tramways Committee.—Mr. F. V. L. Mathias, borough electrical and tramways engineer, Howley, Warrington.

DOWNPATRICK.—May 26th.—For supplying two Appleby pumps, and cleaning out and improving a well, for the rural district council.—The Clerk, The Workhouse, Downpatrick, Ireland.

SOUTHAMPTON.—May 31st.—For dredging work for the Harbour Board. The Engineer, Harbour Board Offices, Southampton.

TYLDESLEY.—June 2nd.—For the supply of gas and water cast-iron pipes and specials, wrought-iron tubes and fittings, gas and water lead pipe, and prepayment gas meters, for the urban district council. Mr. Mark Newsome, gas engineer, Gasworks, Tyldesley.

Mechanically Propelled Vehicles.

MANCHESTER.—May 21st.—For the supply of a new or second-hand motor lorry, about 2 tons, for the board of guardians.—The Clerk, Union Offices, All Saints, Manchester.

KINGSTON-UPON-THAMES.—For the supply of a 5-ton steam or electric wagon, for the corporation.—Mr. R. Hampton Clucas, borough surveyor, Municipal Offices, Kingston-upon-Thames.

Roads.

HALIFAX.—May 21st.—For private improvement works, for the Highway Committee.—Mr. J. Lord, borough engineer, Town Hall, Halifax.

TILBURY.—May 21st—June 4th.—For tar-spraying military and other roads, and supplying 10,000 gallons of refined tar, also tarviated-granite, tarred ragstone, chippings, screened gravel, a heavy Shire-bred horse, two-wheeled street watering cart, laying 600 ft. of 15-in. stoneware pipes and laying 70 superficial yards of artificial stone flagging, or alternatively blue-brick paving and works incidental thereto, for the urban district council.—Mr. S. A. Hill-Willis, engineer and surveyor, Council Offices, Tilbury.

ELY.—May 25th.—For the supply of 870 tons of machine-broken Leicestershire granite, for the urban district council.—Mr. W. McKelvie, surveyor, Ely.

LYMM.—May 26th.—For the supply of tar macadam, for the urban district council.—Mr. D. Mort, surveyor, Council Offices, Lymm, Cheshire.

BURGESS HILL.—May 28th.—For the supply of 500 tons of broken granite between 1½-in. and 2-in. gauge, and 100 tons of small granite for binding, also 15,000 of refined tar, for the urban district council.—The Surveyor, Council Offices, Burgess-hill, Sussex.

STAMFORD.—May 31st.—For the supply of 1,500 tons of X-broken granite, for the corporation.—Mr. R. Ryman, borough surveyor and engineer, Town Hall, Stamford.

FAREHAM.—May 31st.—For the supply of granite, basalt, or other hard stone, for the rural district council.—Mr. J. F. Whitear, surveyor, 18, Southampton-road, Fareham, Hants.

Sanitary.

NEW ROSS.—May 22nd.—For the construction of sewerage works in Rosbercon, for the urban district council.—The Clerk, Urban District Council Offices, The Tholsel, New Ross, Ireland.

BRADFORD.—May 22nd.—For emptying and cleansing middens, cesspools and dustbins, for the corporation.—Superintendent Call, Hammerton-street Depot, Bradford.

MELTON MOWBRAY.—May 30th.—For the construction of a sewer, about 350 yards in length, for the rural district council.—Mr. G. E. Fryer, Wyndham-avenue, Melton Mowbray.

THORNE.—May 31st.—For scavenging the town of Thorne, for the rural district council.—Mr. J. Stanley, surveyor, Orchard-street, Thorne, Yorks.

EAST COWES.—For constructing an outfall sewer with manholes, for the urban district council.—Mr. A. E. Barton, engineer and surveyor, Town Hall, East Cowes.

Stores.

FELLING.—May 26th.—For the supply of macadam, Heworth freestone kerb, Heworth setts, whinstone kerb, whinstone setts, Portland cement, shovels, brooms, sanitary pipes and cartage of stone, for the urban district council.—Mr. W. P. Parkin, clerk, Council Buildings, Felling-on-Tyne.

Miscellaneous.

KENT.—For the erection of about 70 rods of spill fencing, for the county council.—Mr. A. J. Burrows, acting county land agent, Ashford.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MAY.

18. Institution of Mechanical Engineers: Mr. A. E. L. Chorlton on "The Construction of Turbine-Pumps." Institution of Civil Engineers. 6 p.m.

18. Junior Institution of Engineers: Mr. E. C. Barton, M.I.E.E., F.G.S., on "Metric Weights and Measures and Decimal Coinage."

JUNE.

1.—Town Planning Institute: Adjourned discussion on Mr. Rees Jeffreys' paper, "Road Construction and Improvements by Means of Town-Planning Schemes." The Surveyors' Institution, 12 Great George-street, Westminster. 6 p.m.

4. Surveyors' Institution: Annual General Meeting. 5 p.m.

6. Institution of Municipal Engineers: General Meeting in London. Mr. Reginald Brown, M.INST.C.E., on "House Refuse: Its Calorific Value and its Possibilities." 6.30 p.m.

21-22. Incorporated Municipal Electrical Association: Annual Meeting. Institution of Civil Engineers, Great George-street, S.W.

22. Institution of Water Engineers: Summer Meeting in London.

28-30. Institution of Municipal and County Engineers: Annual Meeting at Hastings.

29. Tramways and Light Railways Association: Annual Congress. Institution of Civil Engineers, Great George-street, Westminster. 2.30 p.m.

PURE WATER

WE Guarantee a supply of Pure Water with our PATENT MECHANICAL FILTER—clear and sparkling water, fit for Town Supplies or industrial uses. We supply efficient plant to remove bacteria, suspended matter, iron, colour and all impurities.

Over 170 million gallons per day are purified in our Filters.

The bacteriological purity obtained with our Filters is nearly 100%.

Mather & Platt, Ltd.
MANCHESTER and LONDON.

WE have had the widest experience of the construction and erection of water purifying plant, and are consequently familiar with all the details necessary for the effective carrying out of water filtration schemes. Write us. We shall be pleased to fulfil your requirements.

Our Filters are extensively used by the War Office for the Water Supply of Camps and Munition Works.

ROAD MAKING.

REINFORCE CONCRETE ROADS WITH
EXPANDED METAL.

EXMOUTH SEA DEFENCE WORKS. Expanded Steel-Concrete Slope and Roadway. Length 1 mile; total width of Roadway, 45 feet.
Mr. SAMUEL HUTTON, Urban District Council Engineer and Surveyor

THE EXPANDED METAL COMPANY, LIMITED
(Patentees and Manufacturers of Expanded Metal).
Head Office: YORK MANSION, YORK STREET, WESTMINSTER, LONDON, S.W.
Works: STRANTON WORKS, WEST HARTLEPOOL.

APPOINTMENTS OPEN.

ETON URBAN DISTRICT COUNCIL.
SURVEYOR AND INSPECTOR OF NUISANCES.

Applications are invited for the above whole-time appointment. Salary £150—office, stationery, &c., provided. The successful applicant must hold the testamur of the Royal Sanitary Institute and of the Institution of Municipal and County Engineers, and must have had practical experience in sewerage and sewage disposal, maintenance of roads under modern conditions, inspection of buildings and other municipal work.

Applications, giving detailed information as to training and experience, ages, &c., and accompanied by copies of recent testimonials, to be forwarded to the undersigned, marked on envelope "Surveyor," not later than Saturday, the 2nd June next.

Canvassing in any shape or form will disqualify.

J. E. GALE,
Clerk.

3 Sheet-street,
Windsor.
May 5, 1917. (3,405)

BOROUGH OF OSWESTRY.

Steam Roller Driver (ineligible) Wanted; part-time as general worker. Applications, stating experience, wages required, to Mr. G. William Lacey, Borough Engineer, Oswestry. (3,414)

CITY OF BIRMINGHAM.

Applications are invited from men ineligible for military service for the position of a Temporary Surveying Assistant in the Town Planning Department, at a salary of £3 3s. per week.

Applicants must have had previous experience in the work of surveying, levelling, and preparing plans, &c.

The appointment will be terminable by one calendar month's notice on either side. Applications, endorsed "Surveyor's Assistant," stating age, experience, present employment, reason why ineligible for military service, and what documentary or other evidence can be submitted in support thereof, and accompanied by copies of three recent testimonials, should reach me by Tuesday, 22nd May, 1917.

HENRY E. STILGOE, M.INST.C.E.,
City Engineer and Surveyor.

The Council House,
Birmingham. (3,412)

COUNTY BOROUGH OF HALIFAX.
SEWAGE WORKS FOREMAN.

The Highways Committee of the Halifax Corporation invite applications for the post of Foreman at their Salterhebble Sewage Disposal Works, which consist of Precipitation Tanks, Sludge Pressing Plant, Contact Beds, and Percolating Filters.

Applicants must have had previous experience on a Sewage Disposal Works.

Applications, in candidate's own handwriting, stating age, experience, and salary required, accompanied by copies of not more than three recent testimonials, to be sent to the Borough Engineer, Town Hall, Halifax, on or before Monday, the 4th June.

(By Order)
PERCY SAUNDERS,
Town Clerk.

Town Hall, Halifax,
May 11, 1916. (3,416)

MISCELLANEOUS.

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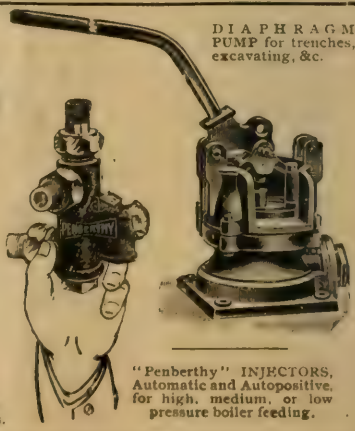

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The Surveyor

And Municipal and County Engineer.

Vol. LI. MAY 25, 1917. No. 1,323.

Minutes of Proceedings.

Demolition Orders.

The recent case of *Broadbent* v. *Rotherham Corporation* (noted in our issue of last week) should be carefully considered by local authorities who have to deal with premises unfit for human habitation. It will be remembered that the mode of procedure for Closing and Demolition Orders in respect of such premises is prescribed by secs. 17 and 18 of the Housing and Town Planning Act, 1909, sec. 17 relating to Closing Orders, and sec. 18 to Demolition Orders. Under sec. 18, sub-section (1), where a Closing Order has remained operative for three months, the local authority are to take into consideration the question of demolition, giving the owner not less than a month's notice of the time and place when and where the question will be considered, and the owner is entitled to be heard on that occasion; under sub-section (2), if, on such consideration, the authority are of opinion that the premises have not been rendered fit for human habitation, and that the necessary steps are not being taken with all due diligence to render them so fit, *or* that the continuance of "any building, being or being part of the dwelling-house," is a nuisance or dangerous or injurious to the health of the public or of the inhabitants of the neighbouring dwelling-houses, they must order the demolition of the building; but, under sub-section (3), if any owner undertakes to execute forthwith the works necessary to render the house fit for human habitation, and the authority consider that this can be done, they may, if they think fit, postpone the operation of the Order for such time, not exceeding six months, as they think sufficient for the purpose of giving the owner an opportunity of executing the necessary works. Thus, it will be noted, the duty of the authority to make a Demolition Order, in the circumstances stated in sub-section (2), is absolute; but they have a discretion to postpone its operation under sub-section (3).

In the Rotherham case Closing Orders were made with respect to several houses belonging to the plaintiff. In July, 1914, these Orders were confirmed by the Local Government Board, on appeal; and in May, 1915, Demolition Orders were made. The owner then applied to the corporation to postpone the operation of the Demolition Orders. She stated (*a*) that she was prepared to put the property in order, (*b*) that her architect had gone into the matter, and (*c*) that her builder had been instructed to prepare specifications and tender for the work, which would be started forthwith. And she asked the corporation to state if they accepted the specifications when received, and to allow their officer of health to meet her architect on the premises, as it would be a great pity to pull the houses down. The corporation, however, were advised by their officer of health that the houses were incapable of being made fit for habitation; and having regard to that advice they *bonâ-fide* refused the application, without either giving the owner any opportunity of submitting her specifications or allowing her architect to meet their officer. In these circumstances Mr. Justice Astbury came to the conclusion that there had been no proper exercise by the corporation of their discretion, under sub-section (3), and he therefore granted the injunction asked for by the plaintiff, restraining them from proceeding to enforce or carry out the Demolition Orders until they had "heard and determined according to law" the plaintiff's application for postponement. It appears from this decision that the discretion given to the local authority by sub-section (3) is a *quasi*-judicial function, and that it is essential to its proper exercise that an owner should, at all events, have the opportunity of properly presenting his case. It may well be that in many instances his case would be unconvincing, or even if convincing that it would not affect the result. In the Rotherham case, for instance, even if an examination of the specifications had shown that the property could be made fit for habitation, the corporation might still have had excellent reasons for deciding not to postpone the operation of the Orders. But that is not the point.

* * *

"Consulting" Engineers.

In a recent issue of the *Engineering News-Record* there appears a well-reasoned article from the pen of Mr. George Whipple, the Professor of Sanitary Engineering at Harvard University, in which he discusses in a very frank way the increasing use or rather abuse of the epithet "consulting" in the professional designation of engineers in practice. It would seem that in America the use of this word is even more common than is the case in this country, and in the interests of accuracy of language it is certainly desirable to ascertain what is or should be its precise significance. In this connection Mr. Whipple asks a series of very pertinent questions. "What is a consulting engineer? Do the words mean the same as they did a generation or two ago? Is an engineer a 'consulting engineer' when he is not being consulted? Does the term represent

a state of willingness or desire to be consulted, the qualification to advise, or does it describe an actual service and cease to apply when the service has been rendered? Does it signify merely an engineer who maintains an independent office and is free to undertake engineering work for any client who comes? If so, by what other title shall be called the engineer engaged to advise or support a fellow engineer or to review his plans or work in order to assure some client that the plans are sound or the work well done? Is it ethical for an engineer to advertise himself as a consulting engineer, or is the use of the word 'consulting' an affectation, an assumed superiority, a self-raised pedestal, a bait to lure the unwary client? Has the noble word 'engineer' become so belittled that it is necessary to bolster it up with an adjective not descriptive of a special field of work, but merely indicating that the holder of the title is looking for a job? Or is the change merely a phase of the general movement to raise society by pulling down a higher title, a movement whereby the washwoman becomes a washlady, the music teacher becomes a professor, the plumber becomes a sanitary engineer?"

These questions are of more than academic interest, because the inaccurate use of the word "consulting" is apt to mislead the lay client and to bring the great profession of engineering into some disrepute. Strictly speaking, an engineer does consulting work only when he is taken in to support or assist another engineer in a purely advisory capacity. There are few men who would be willing to limit themselves to this class of work in the same way as the Harley-street physician who will see patients in consultation only with or upon introduction from their general medical advisers. There is much to be said therefore for Mr. Whipple's view that the title "consulting engineer" is one which should not be *assumed* by any engineer, great or small, but should be used to define the status of an engineer on a particular piece of work or with reference to a particular client.

* * *

Accidents from Falling Trees.

In our issue of February 16th last we made some observations on the subject of accidental obstructions on highways, apropos of the case of *Hudson & Another* v. *Bray*, in which the defendant was held liable for injuries sustained by the plaintiffs and damage to their motor car by collision with a fallen tree belonging to the defendant, which was blown down in a gale and fell across the highway. The recent case of *Bruce* v. *Caulfield* (*Times*, May 2nd) is of most interest in connection with this subject. In that case the defendant was held liable for injury to the plaintiff's premises occasioned by the fall of a pollarded poplar tree growing in the defendant's garden which was blown down in a heavy gale. The case came, in the first instance, before a county court judge, who gave judgment for the plaintiff on the following grounds—viz., (*a*) That the tree, in its pollarded state, was a dangerous thing; (*b*) that, inasmuch as a similar accident had happened in January from a similar tree, the defendant knew that a tree of this kind was top-heavy and dangerous; and (*c*) that, knowing this, he was guilty of negligence in omitting to take any precautions to guard against the consequences of the tree's fall. It is very interesting, however, to note that in the Divisional Court (to which the defendant unsuccessfully appealed) the judges differed in opinion. Mr. Justice Ridley thought that there was no evidence of negligence, notwithstanding the previous accident. In support of this view his lordship pointed out that in the case of a dog, for example, that a puppy of the same litter has bitten strangers is no evidence of knowledge that the particular dog is savage. Neither, in his view, was evidence that similar trees were dangerous evidence that the particular tree in question was dangerous. Mr. Justice Avory, however, though so far concurring as to say that, if he had tried the case, he should have decided for the defendant, would not go the length of saying that there was *no* evidence of negligence. Mr. Justice Ridley therefore withdrew his judgment, with the result that the decision of the county court judge stands.

In considering the bearing of this decision upon the subject of trees falling on the highway, it cannot be said to contribute very greatly to the elucidation of the problem. In perhaps the vast majority of such cases it would probably be extremely difficult, if not impossible, to adduce even the modicum of "evidence of negligence" which satisfied the Court in *Bruce* v. *Caulfield*. It appears from the earlier case of *Hudson & Another* v. *Bray* that when a tree has fallen on a highway, the omission to light or guard it may constitute negligence; but it by no means follows that negligence will be inferred from the absence of any precautions to prevent it from falling. The subject is undoubtedly a difficult one, but, so far as we can gather from the authorities, the liability of a landowner for injuries caused by a tree growing on his land falling or being blown on to the highway would in most cases depend upon two considerations—viz., (1) Whether the tree was a "dangerous thing" in the eye of the law; and (2) whether it was planted by or by order of the landowner. If these questions be answered in the affirmative, then, we suppose, the principle laid down in the leading case of *Fletcher* v. *Rylands* would apply—namely, that anyone who brings a dangerous thing on to his land must keep it there at his peril, unless prevented by what is technically termed "an act of God," or *vis major*. On this principle, it will be seen, the question of negligence is not material; but the qualification does not tend to simplify the problem, since the fall of a tree large enough to cause appreciable damage is rare, except in abnormal weather conditions.

* * *

L.C.C. Tramways.

In consequence of the increased working expenses of the London County Council's tramway system, there is a distinct possibility that, unless some steps can be devised immediately to secure a corresponding increase in revenue, the undertaking may this year, for the first time in its history, involve a charge upon the rates. A special sub-committee on tramways operation was therefore appointed some months ago, and the result of their deliberations is embodied in a report which was presented by the Highways Committee at last Tuesday's meeting of the council. From this it appears that the increased expenditure is due principally to two causes—namely, war bonuses and service allowances—which amount to no less than £268,400 per annum, and the high price of coal and all kinds of materials. To meet this, two proposals were put forward—the abolition of all halfpenny fare stages, and the suspension of the issue of ordinary return tickets. The principal argument for supposing that the adoption of these suggestions will mean a substantial increase in the fares is, curiously enough, an indirect one. It is said that, having regard to the size of the cars and the conditions under which they are operated, it is extremely difficult for the conductors to deal with halfpenny passenger traffic, the short distances involved being covered with such rapidity that these short-stage passengers frequently escape without the payment of any fare at all. In this connection it is interesting to observe that the

council's cars are of the largest type used in this country, and that their average rate of speed 9 miles per hour—is the fastest attained on any system in Great Britain. Many of the conductors are inexperienced, and the complexity of their task renders it impossible for them to perform it efficiently, so that much revenue is lost. The general manager has reported that, in his judgment, there is no doubt that the suspension of the halfpenny fare stage will immediately relieve present difficulties in connection with fare collection, and will result in a considerable increase in revenue. In the same way the abolition of return-fare tickets will mean greater efficiency in fare collection, owing to simpler working. The council will be fortunate if the anticipated deficiency on the year's working can be met by so simple a plan as that proposed—and adopted at Tuesday's meeting.

* * *

The Late Sir Alexander Binnie.

By the death of Sir Alexander Binnie, which took place on Friday last at the secluded little fishing village of Beer on the South Devon Coast, there has been removed from the world of municipal engineering one of its most distinguished ornaments. A highly successful professional career culminated in his appointment as Chief Engineer to the London County Council, and the many works which he carried out in that capacity form an enduring memorial to his fame. Among these works the tunnels under the Thames at Greenwich and Blackwall are perhaps worthy of special mention. Most men would have been daunted by the difficulties which these works presented. Indeed, it is said that Sir Weetman Pearson (now Lord Cowdray), the contractor for the latter, advised Sir Alexander "not to attempt the impossible." The attempt was made, however, and the efforts of engineer and contractor were crowned with success. But Sir Alexander Binnie will be remembered almost as much for his lofty view of the dignity of his profession as for his splendid record of actual achievement. While fully realising the importance of locally elected bodies as deliberative assemblies, he was very jealous of their attempting to usurp the legitimate functions of their expert advisers by interfering with the details of engineering work. In the course of his address as president of the Institution of Municipal and County Engineers in 1897, he pointed out that, up to a certain point, local authorities must discuss the general principles of contemplated engineering works, but he expressed the opinion that it would conduce to the general welfare if there were less discussion of details and criticism of uncompleted work. If, however, the status of the profession is to be raised to the standard involved in this suggestion, steps must be taken to secure that municipal engineering appointments are open only to men of adequate professional attainments, who should be properly remunerated. Sir Alexander Binnie was a consistent advocate of these principles, and his wisdom in counsel and strength in action will be sorely missed.

* * *

Landlords and the Dundee Housing Scheme.

We note that the Dundee Landlords' and House Factors' Association have issued a statement in which they condemn certain economic features of the public improvement and housing scheme of the city engineer, Mr. James Thomson. In this it is asserted that the exclusion from the expenditure upon the property proposed to be built of the feu duty, and the provision of roads is a proposal which amounts to placing a large share of the cost of the scheme on the general body of ratepayers for the relief of a privileged few. "Housing," it is added, "should not be dealt out to one section of the community in the form of charity at the expense of a considerable number of their fellow-citizens already bending under the strain of taxation levied on them." The point of view is, of course, everything, but it seems to us that the gentlemen who have made themselves responsible for this document—who are of those "privileged few" who have always benefited handsomely from expenditure upon public improvements—have, so far as they imply a preference for private as against public schemes, fallen into the error of confusing two things which, though apparently similar, differ essentially in their scope, and to some extent in purpose. A housing scheme involving also a great public improvement cannot be compared with an ordinary building scheme for the erection of house property. The aim of the one is altruistic. It involves the expenditure of public money for the general benefit. The aim of the other is speculative and profit-earning. In the circumstances, it is well within the right of the municipal authority so to adjust some of the liabilities which the scheme involves as to place the burden upon the shoulders of the general body of ratepayers. It has been found necessary to do this in London, where the cost of housing schemes is enormous, in order to equalise the rents, otherwise the latter would be prohibitive, and re-housing in certain areas would become virtually impossible.

* * *

After Thirty Years.

The surveyor to the Easingwold Rural District Council has been in the service of that authority for thirty years, and his present rate of remuneration is—three pounds a week! In these circumstances he had the temerity to make application for an increase of salary—which has remained stationary for eighteen years, although, as may easily be imagined, the duties of his office have become considerably more onerous during that time. When it is known that out of his own pocket he has to pay for any necessary clerical assistance, to provide office accommodation, and means of conveyance, it would be difficult even for the most exacting "economist" to suggest the sum which he receives is in any way excessive. Nevertheless, a voice was raised against a modest proposal to increase the salary by £10 a year. As usual, "no one had a higher regard for the surveyor" than the objector, but . . . And then came the usual comparison with the wages received by the workmen, "who had stomachs that needed satisfying just the same as the others." These wages were said to be "infinitely smaller" than the salary of the surveyor. If so, they must indeed be microscopic. Happily, however, an amendment to the effect that the proposed increase should be in the nature of a war bonus, and should not be permanent, failed for want of a seconder. The surveyor is to be congratulated upon the virtual unanimity with which this modest and tardy recognition of his long service was granted.

Professional Men and National Service.—A question was put in the House of Commons on Monday as to whether the Parliamentary Secretary to the Ministry of National Service was aware that dissatisfaction prevailed among the men who had enrolled as professional and commercial men on the special register owing to the unsuitable nature of the employment he was offering to them. Mr. Hodge said he had been asked to answer the question as the work of placing professional and commercial men had been entrusted by the Director-General of National Service to the professional and business register of the Ministry of Labour. He was not aware of the dissatisfaction referred to, but if he could be informed of any specific cases he would cause enquiries to be made.

Excess Water in Concrete.

By Prof. DUFF A. ABRAMS.

[In the *Concrete Highway Magazine*, published by the Portland Cement Association, Professor Abrams outlines in the following article the evils of excess water in concrete, and suggests the remedy.]

Experience has indicated about what proportion of cement and aggregate must be used to give concrete of the necessary resistance for a given purpose, but little attention has been given to the inter-relation of the effects of varying quantities of water on the resistance of the concrete.

A thorough investigation of this subject is in progress at the Structural Materials Research Laboratory, Lewis Institute, Chicago. These tests have shown the following relations to obtain:—

1. With a certain aggregate of the same grading and sufficient water to produce a concrete of a given plasticity, the strength of the concrete, within the usual range of mixes, is proportional to the quantity of cement in a unit volume of concrete.

2. With a given aggregate and the same quantity of cement, the strength of the concrete is a maximum with the smallest quantity of water which can be used to produce a plastic mix; any increase in the quantity of water is accompanied by a very rapid falling off in the strength of the concrete.

3. With a given aggregate mixture, the same quantity of cement, and sufficient water to produce a concrete of definite plasticity, (*a*) the strength of the concrete increases with the "coarseness" of the aggregate up to a certain limit; (*b*) this limit of "coarseness" is higher for a larger quantity of cement and lower for a smaller quantity of cement; (*c*) the limit of "coarseness" of the aggregate which it is feasible to use varies slightly with the character of the material, being somewhat lower for a mixture of sand and crushed stone than for sand and well-rounded pebbles, and lower still for mixtures in which crushed stone or similar material is used as fine aggregate.

4. For given proportions of cement and aggregate the quantity of water required for a definite plasticity depends largely on the grading of the aggregate and to only a minor degree on the character of the material, shape of particles, &c.

5. For a given aggregate, the quantity of water required to give concrete of the same relative plasticity is directly proportional to the quantity of cement.

TOO MUCH WATER USED.

If we assume that concrete materials of suitable character are at hand, and that mixing and other details are properly cared for, the engineer generally has the following alternatives for improving the quality of the concrete:—

(*a*) More cement.

(*b*) Coarser aggregate (within certain limits).

(*c*) Less water (limited by the necessity of producing a plastic mix).

Economy dictates the use of the smallest quantity of cement which will produce concrete of the desired resistance. The tendency has been during recent years to use entirely too much water; in many instances the water used is 50 to 100 per cent in excess of the quantity which gives the highest strength, resulting in concrete of not more than 25 to 50 per cent the strength that should have been obtained with the same cement and aggregate and a proper quantity of water. While some sacrifice in strength is generally necessary in order to secure concrete which may be handled and placed at low cost, it is absurd to sacrifice 50 to 75 per cent of the strength which is practically available in this way. While the injurious effect of excess water in concrete has been given little attention, a great deal of emphasis has been placed on the benefits to be derived from the use of coarse, well-graded aggregate.

The experimental work referred to above has already thrown much new light on the subject. We are forced to the conclusion that the chief advantages of well-graded and coarse aggregate as compared with poorly-graded aggregate comes from the fact that the concrete can be mixed to a workable plasticity with less water, and not to any inherent difference in the behaviour of aggregate of different sizes. In other words, while coarse, well-graded aggregate is highly desirable, little or nothing is gained by using aggregates of the largest grade unless we take advantage of the fact that it can be mixed with correspondingly less water. This makes it apparent that many of the shortcomings of concrete made of fine or poorly-graded aggregate should be charged to the additional water required to mix the concrete.

LIMIT TO QUANTITY OF WATER.

It is as important that an upper limit be placed on the quantity of water as it is that a lower limit be placed on the quantity of cement in the batch. It would be just as consistent to specify the quantity of aggregate and water and leave the proportioning of the cement to the judgment of the mixer foreman, as to specify the quantity of cement and aggregate and leave the proportioning of the water to the mixer gang. Exactly the same effect is produced by the use of an excess of water as by a deficiency in cement; and it is more important now that special attention be given to the water in concrete, since the present methods give reasonable assurance that the proper quantity of concrete is used.

All the benefits which may arise from using good cement, coarse, well-graded aggregates, thoroughly mixing the concrete, &c., are completely nullified if an excess of water is used in the mix.

The diagram (Fig. 1) summarises the results of compression tests on 6-in. by 12-in. concrete cylinders

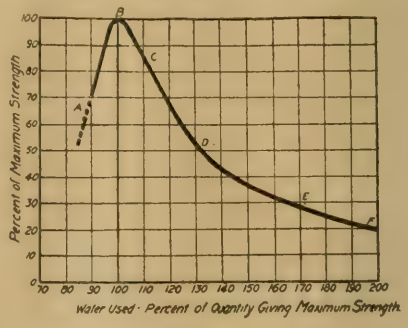


Fig. 1.

made in mixes ranging from one part cement and nine parts aggregate to one part cement and two parts aggregate by volume. These mixes represent concretes of all qualities from the leanest to the richest which are generally used for any purpose. The aggregate consisted of a mixture of sand and pebbles graded in size from the finest particles up to 1¼ inch; exactly the same grading was used in all cases.

These tests show that the effect of proportional changes in the mixing water is approximately the same for all mixes of concrete; consequently a composite curve has been drawn to show the average effect. The vertical distances represent the relative strength of concrete, expressed as a per cent of the maximum which can be secured from a given amount of cement and the same aggregates. The horizontal distances indicate the relative quantity of water used in the mix, considering the amount which gives the maximum strength as 100 per cent.

The amount of water which gives the maximum strength in concrete produces a mix which is too stiff for most purposes. In plants where such products as building units, drain tile, sewer pipe, &c., are manufactured it is desirable to use a mix even drier than that which gives the maximum strength. The moulds can thus be removed within a short time; this would be impossible if a wetter and more plastic mix were used.

It will be noted that the concrete strength increases rapidly with the quantity of water over the range indicated by A-B on the diagram. With any further increase in the amount of water there is a rapid falling off in strength, as indicated by the curve BCDEF. With an amount of water about double that required for highest strength, the concrete has only about 20 per cent of the maximum strength.

The exact amount of water corresponding to the maximum strength of concrete will vary with the method of handling and placing the concrete. Any

method which involves puddling, tamping, rolling, or vibration, or the exertion of pressure in any manner, will have a tendency to increase the strength of the concrete, regardless of the amount of water used. However, it is probable that the effect produced by these methods will be more pronounced in the consistencies in the vicinity of the maximum strength.

"In mixing concerte use the least quantity of water that will produce a workable mix, then give the concrete as much water as possible after it has begun to harden," is the only safe rule to follow. The amount of water which should be used with given materials cannot always be determined in advance; it will also vary with the nature and size of the work. However, every effort should be made to keep the water content of the concrete at a minimum. It is not feasible to use the quantity of water corresponding to the highest possible strength of concrete (a similar statement may be made with reference to the "coarseness" of the aggregate), yet this difference should be reduced to a minimum by using the smallest practicable amount of water.

The abuse of the water element in concrete has come about solely from the fact that it is cheap, and frequently facilitates handling and placing. Much of the concrete which is being made at the present time could be greatly improved, at no additional cost, if the owner were compelled to pay, say, ½ to 1 per cent per gallon for all water going into the mixer. In many respects it is unfortunate that water is not an essential element in the cost of concrete.

Probably the greatest improvement which can be made in our present methods of manufacturing concrete will come from a better understanding of the very injurious effect of excess water and a saner practice in proportioning this important element of the mix.

ROAD FOUNDATIONS.*

By George Hogarth, A.M.Can.Soc.C.E.,
Chief Engineer, Ontario Department of Public Highways.

While drainage is undoubtedly one of the first essentials of good highways, the foundation of a road is also of great importance. The foundation of a road should normally last a number of years, while the cost of maintenance should be for replacing and renewing the worn-out surface. Such conditions are difficult to obtain, since the foundation of four inches of crushed stone to-day may be entirely inadequate to-morrow under more severe traffic. The heavy loads using our highways to-day require an abundance of material in the foundation of the roads, and if our work is to be enduring we must see to it that strong and sound foundations are provided.

The fact that improved roads draw increased traffic should be given full consideration in designing a road and providing its foundation, and any traffic census made prior to reconstruction should be considerably increased in order to estimate the travel on the improved surface. In some cases it may be found that the traffic on an improved road immediately after reconstruction is ten or more times the original number of vehicles using the road, and this must be provided for.

Building Trade and Restricted Occupations Order.—It was announced in the House of Commons on Monday that in view of special arrangements which had been made by the National Service Department with the representatives of employers and workpeople in the building trade for the release of men to act as substitutes and reinforcements in essential industries, it had been agreed that the provisions of the Restricted Occupations Order should not in future be enforced as regards that trade. Similar arrangements had been come to as regards certain other trades covered by the Schedule to the Restricted Occupations Order.

* Extract from paper presented to the Fourth Canadian and International Good Roads Congress.

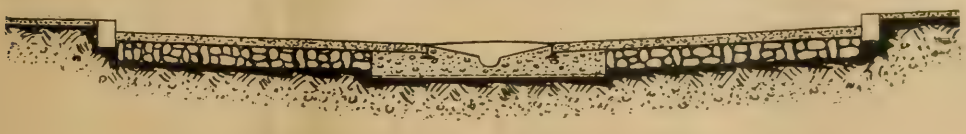
LOOKING AHEAD.

By A Correspondent.

Sometimes I have wondered, when walking along a road after the passing of vehicular traffic which has raised clouds of dust, whether we really do live in the twentieth century, and if so, will a cartoonist at some distant date depict such a scene as now obtains, of pedestrians groping their way in clouds of germ-carrying dust, and provide humour for future generations at the expense of twentieth-century road engineers.

I suppose many engineers have had visions or dreams of the streets of our cities being "metalled" in a very real sense—when perhaps the traffic will be wholly of the rubber-tyred description—by being formed of perforated metal gratings of suitable strength, with proper provision made for foothold, and provided underneath with drainage arrangements, so that, whatever the state of the weather, the roadways, at any rate, will be free from practically all the ills which they are at present heir to.

It would almost seem that we are not looking sufficiently far ahead, as we still continue to construct tramway tracks in our roadways without the least attempt at any improvement of the surface of the road. The road shown in the accompanying drawing is suggested as the "thin end of the wedge," which may



Cross Section of Proposed Centre-Channel Road.

ultimately lead to the type of road just referred to. Instead of having a channel on each side of the street, with a fall from the centre of the road—which channels very often retain water and filth, and are a source of discomfort to pedestrians, while surface water frequently percolates through the joints into the basements of adjoining houses—the grooves of the tram-rails would form the channels, and the roadway would fall from the kerb on each side to these channels. Outlets would be formed at certain intervals which would communicate with the sloping surface leading to the drainage channel below the track, which channel would be laid to proper falls, and the surface water carried away to gullies fixed at suitable distances apart connected to the sewer in roadway.

Between the rails would be placed cambered perforated metal grating in suitable lengths, supported as required, ensuring, at any rate, that the centre of the track would not be under water during bad weather. The metal grating, in the event of any section being damaged, could be quickly taken out and a new section dropped into position without it being necessary to hamper the traffic by the class of repairs which have to be executed at the present time. Access to the drainage channel, gullies, &c., for cleansing purposes would be obtained by lifting out any section required, and no doubt a suitable grating could be manufactured by being designed so that at frequent intervals hard-wood blocks would be inserted to provide proper foothold. This portion of the roadway would always be free from dust, potholes, &c., even in the worst weather, and would, no doubt, be the first step on the way to the ideal "metalled" road of the future.

In the case of the running of tramcars there would be no chance of the suction produced under the cars raising clouds of dust as at present, and this would apply equally to motor traffic, as this portion of the roadway would no doubt be greatly favoured by the drivers of these vehicles; and if it proved in the case of the first experiment that the foothold for horse-drawn traffic is unsatisfactory, there is still plenty of proved suitable roadway adjoining which can be used. An additional advantage is that, in the case of any traffic being drawn up alongside the kerb in the street, the body of the vehicle would slope away from the pavement instead of leaning towards it as at present, thereby avoiding any chance of interference with overhanging awnings, &c.

Advantage would also be gained in the scavenging of the streets, as the grooves of the tram rails would be kept clean, so as not to interfere with the free passage of surface water. In the case of it being required to form crossings over the existing pavements, these

...ould be arranged without it being necessary, as now frequently occurs, for a new street gully to be fixed, owing to the fall in the channel having been broken up. No doubt there are similar advantages exist, but what has been stated should lead some engineer to show the progressive spirit when new tracks are to be constructed.

TAR AND SAND GROUTED ROADS.*

By Wm. D. Sohier,
Chairman Massachusetts Highway Commission.

Mr. Brodie, city engineer of Liverpool, and one of the most experienced road builders in the world, has developed a form of construction that he believes will prove economical and has proved economical for ordinary light city traffic, but not for heavy teaming.

Certainly when some of his roads were twelve years old, in 1914, the roads built by this method were in most excellent condition. They had not been patched or resurfaced, whereas the water-bound macadam road just beyond, carrying the same traffic, had been lightly resurfaced every year.

THE LIVERPOOL METHOD.

The usual method is as follows. After the foundation is properly prepared and well compacted, about 4½ in. of 2-in. to 2½-in. stone is spread and well rolled. This is grouted with pitch and sand, mixed and kept constantly agitated. They then spread and roll in with a steam roller stone of about 1½ in., which is grouted with pitch and sand and rolled down with a steam roller, the wheels of which are kept constantly wet. Into this top they roll chips or ¼-in. stone.

During the last few years they have been putting on a surface application of the pitch and sand and covering it with pea stone, all well rolled.

In Liverpool the tar and sand is usually heated at a central plant and hauled to the road by a steam tractor. The tar and sand is mixed in a two-wheeled, 35-gallon tar kettle. They use about an equal quantity of tar and sand. . . . This is mixed and kept constantly agitated by a man with a paddle. The men pour it by hand from buckets that hold about 1½ gallon, pouring it very evenly.

The sand used is a fine sand about like the sand used in plastering. The important point is to secure a sand that is the right size to stay in suspension in the tar and not settle to the bottom too quickly. Of course, the coarser the better, if it can be kept evenly in suspension until used. The tar and sand are both heated to about 250 deg. Fahr.

Mr. Brodie, if I remember correctly, figured the additional cost of this work over and above the cost of a water-bound macadam at from 25 to 35 cents (approx. 1s. to 1s. 6d.) per square yard.

Where we have constructed some roads of this character, we have heated our sand and tar at the roadside, using tar kettles, and a sand heater to heat the sand. We built a box on wheels, sloping to the end, and had a flexible pipe with a flat nozzle from which the tar and sand mixture was poured into the road.

In Natick, where some work of this character was done in 1914, the old macadam road was scarified; about 2-in. of 2½-in. stone was spread and rolled; this was grouted with the tar and sand mixture, and finer stone was rolled in. The cost was about 73 cents (approx. 3s.) per sq yd. The road has been most satisfactory, and it certainly looks now as if it would last for ten years at least, on a road with about fifty trucks a day and over 700 motor vehicles.

We have used this method of construction on quite a number of stretches of road, especially on grades, as a horse is less slippery for horses than any other type of bituminous surface, especially if the surface coat is left off and the stones are allowed to project a little.

The sand used seems to stiffen and strengthen the whole road, and we believe the use of the sand prevents the tar from oxidising for many years, and greatly adds to the life of the road.

CONSTRUCTION HINTS.

We developed this year a very good contrivance for securing an even distribution of the mixture. Two plank bridges were used that bridged the road. They were of 2-in. plank, supported in the middle on a 2-in. plank on the crown of the road and built up on the sides. Another 2-in. plank, running lengthwise of the road, was supported on these, and the man pouring the mixture walked along this plank, holding his bucket right against the plank and walking at a rate of speed that just emptied the bucket in the length of the plank. A flat-nosed bucket was used, with a nozzle about 8 in. in width.

By placing the bridges the right distance apart, one bucket covered just the proper area. We poured about two gallons to each square yard of surface. Keeping the bucket against the edge of the plank secured a straight edge on the road. The plank was then moved along on the bridges across the road, and the process was repeated until the whole width was done. There were practically no spaces left where the voids were not filled, and the bitumen did not lap. By keeping the same men on the pouring and having the hot mixture brought to them, uniform results were insured and the work progressed rapidly.

In England, in several instances, I think in all where they were rolling either a sand pitch grouted road, or grouting with tar a stone road, they were wetting the wheels of their roller. In one or two cases they had a man on each side constantly pouring water on the roller wheels. This was to prevent the tar from picking up on the wheels of the roller.

In Liverpool they make a little ordinary water box and place it over the wheel of each roller. In the bottom of the box they leave a little opening on one side, and put in a piece of crash or linen towelling, which hangs down over the roller wheel and keeps it just moist, the roller man filling the box from time to time with water. They say it does not need much water, but merely enough to keep the wheels of the roller damp, and when they tried other methods they got too much water and it interfered with the hot tar surface, pitting it. The box is just the width of the roller wheel, about 12 to 14 in. square. When they used too much water, they got blow-holes in the tar.

* From a paper entitled "Bituminous Macadam Roads," presented at the Boston and International Good Roads Congress, held at Ottawa.

SEWAGE UTILISATION AT BRADFORD.

"A NATIONAL SERVICE."

The success of the Bradford Corporation with their scheme for the extraction of grease at the sewage works has attracted the attention of the Government. Samples of the grease and manure have been analysed by Government experts, and as a result the chairman of the Sewage Committee (Alderman R. Johnson) and the deputy chairman (Mr. John Garnett) were summoned to London last week for the purpose of conferences with the Government departments concerned. They were told, the *Yorkshire Post* is informed, that the sewage department of the Bradford Corporation is rendering a national service, and that the grease is of great value to the leather-dressing trade and to certain branches of the textile industries, and that were this grease not available certain fats which have a considerable value in connection with the production of edibles would have to be used for industrial purposes.

It seems that the whole of the trade effluent is not treated for grease recovery because the available plant is not adequate, but the Bradford deputation were urged to do their utmost to increase the output of this grease, and if necessary to put down extra plant for the purpose. The deputation also visited by invitation the food production department, where inquiries were made about the quantities of manure available at Esholt, as, in the opinion of the experts, it has a high fertilising value.

Water Waste: A Washington Investigation.—A daily underground leakage of 1,981,600 gal. was detected and stopped by the Water-Survey Division of the District of Columbia during 1916. According to the report of the engineer department, this amount represents the loss daily through 420 separate leaks that averaged 4,700 gal. per day each. This investigation, it is pointed out, clearly reveals the fact that neglect of leaks produces serious conditions, due to their gradual enlargement. The most fruitful source of leakage was found in the calked lead joints of the small service mains, a total of 101 cases, discharging 607,350 gal. daily, being found. There were also detected 113 corroded iron services, discharging 119,410 gal. daily; wiped joints wasting 342,490 gal. daily; broken lead and pewter services, 201,380 gal., broken cast-iron mains, 142,800 gal., and defective screw couplings, unions, &c., 115,450 gallons.

The Treatment of Sewage.

DISCUSSION OF MR. BERTRAM BLOUNT'S PAPER.

In dealing with the paper on the above-named subject, which Mr. Bertram Blount, F.I.C., contributed to the April number of the Journal of the Institution of Sanitary Engineers, we mentioned that written communications on the contribution had been received from several well-known engineers, and printed with the paper. Extracts from these follow:

Mr. H. Percy Boulnois (past president) writes: We shall, I think, all agree with Mr. Blount as to the deplorable waste that occurs in a large number of factories of various kinds in this country by reason of allowing their trade waste to flow untreated into the public sewers without the slightest effort being made to recover some of the valuable by-products from these wastes. Surely it is time that manufacturers should be alive to the fact that there is often considerable value in their waste products, and that it would pay them handsomely to erect a plant for their recovery under the advice of men like the writer of the paper. This equally applies to the nitrogen and other valuable constituents in our sewage which are now wasted, and we all live in hopes that as the country has been recently stirred to its deepest depth on the general question of waste, the time is not far distant when this deplorable state of things will be altered. With regard to Mr. Blount's remarks as to the undesirability of going to law over technical differences of opinion, do we not all agree that if the experts on each side could only meet and discuss the points at issue, and if they could not agree, refer these particular questions to a third expert and abide by his decision, much of the money at present wasted in litigation could be saved? Another saving to the country.

Mr. G. Bertram Kershaw (member of council) writes: It has often been a matter of surprise to the writer that when chemical figures of analysis of a particular sewage are given, analyses of the water with which the sewage is diluted, and which has to be treated, are rarely given side by side with the sewage figures. Yet waters differ markedly chemically, and where a precipitation process such as lime is used, a hard or soft water must affect the process considerably. Without doubt a serious difficulty in sewage treatment is the proper disposal of storm water, when the rate of flow may temporarily exceed thirty or even fifty times the normal rate. The separate and partially separate-sewerage systems, of which Aldershot Camp and Croydon are fair examples, cut out much of the storm water, but in few cases, save with flat districts, is it practicable to dispense with storm overflows? Apart from the question of harmful microbes, it is the suspended matter which is mainly responsible for the injury to rivers and streams, and much of these solids can be removed by passing the storm water through standby tanks. This is now done at most modern works; storm filters, from the irregularity of their use, choking, &c., yield very indifferent results, and it is found preferable to treat up to three times the dry-weather flow on the ordinary filters, passing the surplus through tanks. The fact is often lost sight of that storm overflow discharges are intermittent, and produce much less damage than the continuous flow of a consistently bad effluent. Undoubtedly, grosser solids such as fæces should be removed before any sewage is turned into either river or estuary, and, under certain conditions, before it is discharged into the sea. Apart from the fact that fæces may float considerable distances, there is always the possibility that some day one may be confronted whilst bathing with what one parted with earlier in the day. The design of an economical and, at the same time, efficient treatment scheme for even domestic sewage is not such a simple matter as may appear. Subsoil water should not be, but usually is, present in sewage to a lesser or greater degree, and forms a disturbing element. Generally speaking, strength of sewage and levels dominate the situation. Trade wastes accentuate trouble with sewage treatment, sometimes by reason of their volume, sometimes owing to their character. As with storm water, so with trade wastes, it is the frequently high ratio of the waste to the sewage for a short time that is apt to cause the mischief. With regard to the average percentage of moisture in sewage sludge, 85 per cent seems rather a low figure. 90 per cent is the figure usually taken, but much depends on the tank process. A reduction of moisture from 99½ per cent to 99 per cent means half the volume of sludge in the latter case.

Major Arthur J. Martin (past president) writes: Mr. Blount addresses himself more particularly to the solid constituents of sewage. Numberless schemes for the production of a marketable sludge have been tried, with uniformly disappointing results, but the latest method of sewage purification, the "activated sludge process," appears to yield a sludge of appreciable value. Mr. Edward Ardern, M.Sc., in a paper read on 1st December, 1916, before the Manchester Section of the Society of Chemical Industry, quotes some remarkable results recently obtained in the experimental treatment of a weak domestic sewage at Withington, in the course of which, incidentally, it was found practicable to shorten considerably the aëration period formerly regarded as necessary, with a corresponding reduction in the cost of treatment. The resulting sludge contained no less than 6 per cent of nitrogen and 4·2 per cent of phosphates (calculated on the dry material), and is regarded as possessing a distinct commercial value. The sludge, however, contains, as a rule, only about an eighth of the fertilising constituents of the sewage, by far the larger proportion of which is in solution. It has been shown again and again, notably on the famous Craigentinne Meadows, that excellent results can be obtained by irrigation with sewage, but the amount of land at the disposal of a local authority is generally so small in proportion to the volume of the sewage that the latter is rather an incubus than otherwise. If, however, arrangements could be made for the supply of sewage (or effluent) to adjoining land at such times as the crops could make use of it, and, subject to proper safeguards against stream pollution, some part of this great national asset might be turned to good account.

Mr. A. P. I. Cotterell (past president) writes: Mr. Bertram Blount's originality of expression lends piquancy to his views on the treatment of sewage. It also helps to emphasise a view of the subject, that of the chemist, which in my experience is always interesting to the engineer, and often helpful. It is so in this case. The author states that the extreme dilution of water-carried sewage is its greatest difficulty. Is that always so? Dr. Adeney has shown us cases where the dilution of sewage is an admirable method of disposal. Judged as a fertiliser, water-borne sewage is certainly handicapped, and this probably is the sense in which the remark is to be understood. The effect of sewage upon fish life has often been misconceived. So long as the diluted water carrying the sewage is not too greatly depleted of oxygen and the particles of sewage are not too large to choke the fish, they thrive on the effluent and make for it. The use of fishponds partly fed by sewage effluent is, in my opinion, a sound proposition, confirmed by the fact that the Chinese adopt it. I appreciate what is said about the utilisation of trade waste. In addition to the satisfactory recovery of wool fats, it is preferable to collect the small coal from coal washings than to pour it into the sewer, and even "pickle" is much better retained by the works than turned down the drain before its strength has practically gone.

Mr. John D. Watson (past president) writes: The author says: "I do not see how the storm water question can be dealt with except by a double system of sewerage, and shall be glad to hear whether this is successfully in use on any large scale." The question of combined and separate systems of sewerage has been the subject of many a debate. It was debated at Brussels when the International Congress of Hygiene and Demography met there in 1903, and the conclusion arrived at was that the separate and combined systems can both be usefully employed, but that the conditions of various towns and districts are so divergent that the course to be taken must depend upon the advice of the engineer—a very generous non-committal resolution. A good and generally reliable guide as to what is practicable is the experience and practice of great cities similarly situated. So far as I know only one of the great cities—Edinburgh—has declared the separate system to be practicable, and I venture to doubt whether the Corporation has in

this matter that "the truth, the whole truth, and nothing but the truth." In this, as in everything else the German endeavours to impress upon us his strong intellectuality. If indeed he has been successful in Berlin it is because of the strict police regulations obtaining there, coupled with the never failing observance of them by a well-drilled populace. Without entering into the merits or demerits of the control exercised by a democratic community, one must recognise that it is extremely difficult to compel adherence to regulations which must be rigidly observed if the separate system is to succeed on a great scale. How is it possible to exclude excrementitious matter from a surface water sewer? Street water carries it off right enough, but it only remains in the sewer to putrefy until rainfall carries it away to the nearest stream. Experience has shown how reliable are the analyses given by the Royal Commission on Sewage Disposal to prove the polluting character of the first flush from surface water sewers. Sewers which serve small, well-regulated residential places may be duplicated with advantage, particularly when the sewage has to be pumped and when surface water can gravitate into an adjacent stream, but time transforms suburban into urban districts, and people forget to distinguish between surface water and foul sewers. Confusion results, and the extra initial cost is rendered useless. Combined sewers with suitable storm water overflows, although not ideal, form the best means of carrying foul liquid to the outfall.

Mr. W. J. E. Binnie (president) writes:—Mr. Blount is to be heartily congratulated on the extremely lucid and comprehensive manner in which he has placed before us the steps by which we have arrived. I think that we all agree that the methods of treatment have reached a stage which leaves room for small improvement, and that attention in the future can most usefully be directed to the recovery of the waste which now goes on. As an illustration of such a possibility which has not been touched on by the author I may cite the following: Some years ago my firm received a communication from America placing at our disposal the results of experiments which had been carried out in the direction of the distillation of sludge. We were so favourably impressed that we consulted the author, who confirmed the results arrived at, but pointed out that the drying of the sludge would practically swallow up all the heat which could be produced by the burning of the oils resulting from the distillation. An interesting process has been patented by Mr. Watson, of the Horsfall Destructor Co., and Mr. Geo. Butterfield, and is dealt with in the 5th Report of the Royal Commission (pages 180 and 181). This process aims chiefly at the recovery of the nitrogen as ammonium sulphite. The great stumbling block has already been referred to, namely, the difficulty of mechanically separating the water which exists in the colloidal state. The bond which holds water and other substances together in a union, which the author aptly describes as a "physical hermaphrodite," is possibly an electrical one, and I am not without hope that a cheap method will be arrived at whereby this union is dissolved and separation can readily take place by mechanical means.

Mr. Bertram Blount writes:—I agree with Mr. Boulnois entirely that the recovery of valuable waste products should be actively pursued especially at a time when the prevention of waste of all sorts is of national importance. As Mr. Boulnois has settled judicially many difficult cases, it is gratifying to me to know that he would like to have many of such controversies put to the most friendly arbitration. I agree with Mr. Bertram Kershaw, who points out that the analyses of sewage are not often given with the analyses of water sold by sale, which is perfectly true, but I do not think that I have over-elaborated the point in my paper that trade wastes are one of the most serious difficulties which the sewage expert has to deal with. The case of the waste of grease at military camps, which is only too well known to most of us, is entirely apposite. Major Arthur J. Martin has pointed out in very cogent terms our national sin of wastefulness. The difficulty of utilisation undoubtedly turns on water carriage, and as this, as far as I can see, must be continued, no monetary gain can be expected at present except in those special cases where there is a commodity of a good saleable value such as grease. I am greatly obliged by the most kindly remarks of Mr. A. P. I. Cotterell, with his entirely right insistence on the need of collaboration between the engineer and the chemist in the disposal of sewage. I agree with Mr. Watson that somewhat too much has been made of the difficulty of a separate system. Sometimes in these matters theoretical considerations are sound, but from a practical and monetary point of view they may not hold. It appears that the happy medium suggested in my paper is that which Mr. Watson mentions, namely, the use of a general system of sewerage with proper storm overflows.

CHINESE DWELLINGS.*

By Arthur Stanley,

Health Officer, Shanghai.

The question of plague has an important bearing on the construction of Chinese dwellings. This was recognised at the time that the Chinese Building Rules were first drawn out. It is held that a house which provides places where rats may obtain seclusion is insanitary on account of the special danger the settlement runs from plague. The amendment of the Chinese Building Rules made four years ago called for solid ground floors and prohibited hollow lath-and-plaster walls and partitions. It is now satisfactory to be able to record that the new Building Rules just published recognise the necessity as a plague-preventive measure of doing away with the hollow ceiling of the ground-floor room. The important question of rat-proofing the roof and roof space remains to be solved, and it is one which should no longer baffle the ingenuity of the more progressive architects.

The fact remains that the common rat in Shanghai is a roof rat. What is wanted is a non-inflammable roof material impervious to rats and providing no hollow spaces accessible to rats which at the same time will be durable, rainproof and comparatively non-conducting as regards heat. In view of the overcrowding and the fondness of the Chinese for roof stages, it is thought that a flat roof of concrete reinforced by bamboo would provide a roof sufficiently durable for a house of Chinese construction. Such a roof, besides being ideal from the plague point of view by excluding rats, would have the additional advantage of providing a place for airing and storage of odds and ends and be less danger from the point of view of fire than the present stages, which greatly interfere with ventilation and lighting of the back yards.

An ordinary Chinese curved tiled roof provides unlimited accommodation for rats. Each row of overlapping tiles forms a run; while the tiles are so loose and soft that rats can without difficulty penetrate and live in comfort and seclusion within, at the same time having ready access to the interior of the house. It should be remembered that ceilings in Chinese houses are a foreign innovation, and by no means a desirable one from a sanitary point of view.

BRIGHTON CORPORATION TRAMWAYS.

PROFITS FROM OLD RAILS.

The balance-sheet of the Brighton tramways undertaking for the year ended March 31st last shows that after meeting all outgoings there is a profit of £7,251. In the previous year it was £2,230. The engineer and manager, Mr. W. Marsh, in his report, states that the new design of motor on the cars, the bodies of which were built at Brighton, continue to demonstrate their superiority in every way over the older type. These cars were completed just before the war broke out, and have each run over 66,000 miles at practically no cost for repairs, other than renewals of tyres, brake blocks, and a few bearings. If this were not an accomplished fact it would have appeared incredible. Mr. Marsh also states that during the year old tram rails were sold for £12 5s. per ton, nearly double the price paid for them when new sixteen years before; and scrap copper was sold for £144 1s. per ton, the highest price reached in the lifetime of the present generation.

Concrete Institute: Annual Meeting Postponed.—The eighth annual general meeting of the Concrete Institute, which was to have taken place yesterday, has been postponed until the autumn. Due notice of the meeting will be given when the programme for next session is issued to members.

* Extract from Annual Report.

DEATH OF SIR ALEXANDER R. BINNIE.

We regret to announce the death of Sir Alexander Richard Binnie, which took place on Friday last at Beer, Devon. Sir Alexander had passed the allotted span, being seventy-eight years old, and it is probable that but for an illness which necessitated the amputation of one of his legs he would have attained a fuller measure of years than he did.

Sir Alexander Binnie was born in London in 1839 and received his education privately. He became in the first instance a pupil of Terence Woulfe Flanagan, M.INST.C.E., and later of John La Trobe Bateman, F.R.S., a past president of the Institution of Civil Engineers. When twenty-three years old he was employed in the construction and laying out of Welsh railways with the late Mr. Mansergh. In 1869 he went to India and served for six years in the Indian Public Works Department. Among other undertakings, he was employed in the construction of the Nagpur waterworks, and was subsequently awarded the Telford Medal and Premium for his account of those works. He was also engaged in prospecting for coal in Chanda, Central Provinces, and for his services in the opening up of this coalfield he received the commendation of the Government of India. His inquiries revealed to him the relationship between annual rainfall and water-supply, with respect to which he wrote: "The one fact that has been established is that if observations are made at a particular place for a sufficient number of years a true average will be established for that place," and he proceeded to show that it would require from thirty to thirty-five years to establish such an average for any given area. This rule, he maintained, was applicable even in districts like the Himalayas, where the annual rainfall is subject to great variations, reaching even to 600 in. He resigned his Indian appointment in 1875, and, returning to England, became water engineer of Bradford, a position he held for fifteen years.

His reputation was now established, and one result of this was his appointment as a chief engineer to the London County Council, a position he held from 1890 to 1902. During this period he was engaged in constructional schemes of the highest importance. He had under his charge the whole of the main drainage of London, including the completion of the sewage disposal works at Barking and Crossness. He was responsible for the construction of the Barking-road bridge over the river Lea, the new Highgate Archway, the tunnels under the Thames at Blackwall and Greenwich, and a sewer tunnel under the Lea. The water supply of London engaged his constant attention, and he displayed remarkable qualities as a witness before Parliamentary Committees and Royal Commissions. Among the schemes he prepared about this period was a proposed new water supply from the river Wye, in Wales, estimated to cost over £18,000,000. He projected and carried through the necessary works for widening the Strand and the laying out of Aldwych and Kingsway.

It was characteristic of Sir Alexander Binnie that in persisting in the schemes for the tunnels under the Thames at Blackwall and Greenwich he was in opposition to the views of at least one prominent engineer, for it is on record that the contractor for the Blackwall Tunnel, Sir Weetman Pearson (now Lord Cowdray), stated at the dinner given on May 22, 1897, in celebration of the opening of the tunnel, that before he accepted the contract the engineer of the Severn Tunnel said to him: "Do not try the impossible. Having both money and reputation to lose, do not be so foolish as to make a contract to construct a tunnel under the Thames in the stratification that exists there. I tell you it is impossible." The tunnels marked a new and welcome era in the history of Thames communication between shores, and Queen Victoria interpreted the gratitude of Londoners by conferring a knighthood upon the subject of this notice.

Sir Alexander, in addition (as already stated) to being the author of a paper on the Nagpur waterworks which secured the Telford Medal and Premium, contributed to the "Proceedings" of the Institution of Civil Engineers a paper on "Mean and Average Rainfall and the Fluctuations to which it is Subject," for which he received a Stephenson Medal and Premium. On several occasions he lectured on waterworks at the School of Military Engineering at Chatham, and these discourses were duly published under Government authority. In addition, he was the author of many valuable professional reports.

He was president of the Institution of Civil Engineers in 1905-6; president of the Institution of Municipal and County Engineers in 1897-8; was a Fellow of the Geological and the Meteorological Societies; and a member of the Royal Institution.

Upon taking up private professional work Sir Alexander became the head of the firm of Sir Alexander Binnie, Son, and Deacon.

The funeral took place on Wednesday at Brookwood. The Institution of Civil Engineers was represented by Sir Maurice Fitzmaurice (president), Sir William Matthews and Mr. C. Hawkesley (past presidents), and Dr. Tudsbery (secretary), and the Institution of Municipal and County Engineers by Mr. Thomas Cole (consultant secretary).

AN APPRECIATION.

To those of us who knew the late Sir Alexander Binnie for many years his death will make a void in our friendships which will be hard to fill. Sir Alexander was not only an eminent engineer, but he was also a man of great culture. He was a student of archæology and an antiquary, and his knowledge on such subjects was profound. He was a delightful companion, full of reminiscences of people and places; he arrested the attention at once as a remarkable man. Even when incapacitated by illness from taking any further part in the active life he had led for so many years, he was still able, from his couch of sickness, to give valuable advice and good counsel to those who sought it, and he was ever helpful to the young engineer who came to him in any dilemma. We mourn his loss, but rejoice that such a man should have lived to grace the profession of which he was so justly proud.—H. P. B.

ROAD CONSTRUCTION AND IMPROVEMENTS.

ADJOURNED DISCUSSION ON MR. REES JEFFREYS' PAPER.

On Friday next, the 1st inst., at the Surveyors' Institution, 12 Great George-street, the discussion on Mr. Rees Jeffreys' paper, "Road Construction and Improvements by Means of the Town Planning Act," will be resumed. The chair will be taken at 6 p.m.

The Town Planning Institute have published the contributions of those who have already taken part in the discussion. The contributors include Sir Herbert Jekyll, K.C.M.G., Colonel Hellard, C.B., Mr. H. P. Boulnois, Mr. J. Walker Smith (Local Government Board for Scotland), the borough engineers of Great Yarmouth (Mr. J. W. Cockrill), Blackpool (Mr. J. S. Brodie), Edinburgh (Mr. A. H. Campbell), the county surveyors of Surrey (Mr. A. Dryland), Herts (Mr. J. S. Killick), Durham (Mr. A. E. Brookes), North Riding (Mr. W. G. Bryning); Mr. Lewis Beard (town clerk, Blackburn), Mr. F. H. Owers (county accountant, Essex); Messrs. Aldridge, Shawcross, Culpin, George Cadbury, junior, Lawrence Chubb; and Professors Cannan and Abercrombie.

Mr. Jeffreys completes his survey of the progress of town planning by including an appendix relating to Scotland. In his reply on the discussion he warns those who are interested in housing and road transport facilities from looking to the State to provide new roads. This he suggests is a function of local authorities, and by combinations of area they should be constituted and equipped for the purpose.

Copies of the discussion, as well as the original paper, can be obtained by those interested from Messrs. Ede and Townsend, 30-34 Tabernacle-street, E.C. 2.

Waste Leather for Road-making.—Mr. M. C. Lamb, speaking at a meeting of the Chemical Industry Club on the commercial utilisation of condemned army boots, said a promising way of utilising this waste leather was in the making of roads. He had suggested that the soles only should be employed for that purpose, a more profitable use having been found for the uppers. Leather could also be converted into a cheap and excellent substitute for wood paving, affording a good foothold for horses and grip for leather tyres. One speaker said if pulverised leather was heated to a level under 100 deg. and while hot subjected to great hydraulic pressure, slabs would be produced which made first-class and durable flooring.

Gloucestershire Roads.

By Sir R. ASHTON LISTER, Acting County Surveyor.*

The conditions and difficulties as regards the maintenance of the Gloucestershire main roads during the past twelve months have been of a wholly abnormal and unprecedented kind: practically the whole of the contractor's staff and plant have been continuously engaged on orders from the Government for military purposes, with the result that it has been impossible to obtain adequate supplies of material. The contractors have also been hampered owing to the railway companies' rolling stock not being available for this class of traffic. With the limited supplies of tarred macadam available, every effort has been made to cope with temporary repairs on the roads.

This enforced economy on the roads will make it necessary that a very large expenditure on maintenance will have to be incurred immediately materials and labour are available.

Six very important Government works have been established in various parts of the county, some of which will vastly increase the industrial importance of the districts affected after the war, and the heavy motor and traction traffic in connection therewith, also the increased haulage of English-grown timber, have resulted in many of the principal roads being seriously damaged. In one instance the Road Board issued a requisition for the repair and improvement of a length of main road by the council at the expense of the military authorities. In another case, after obtaining my consent, the Road Board have taken over the maintenance of certain main roads in the Henbury district until the heavy traffic has ceased. Every endeavour is being made to obtain adequate compensation from all the other parties concerned; this has occasioned a considerable increase of travelling and clerical work, which has been very cheerfully gone with my small staff.

LABOUR AND WAGES.

Owing to the increased rates offered for labour at these Government works, there has been no alternative but to advance the wages of the council's employees in the districts affected, in order to retain their services on the roads. The question of team labour is also a very difficult one, owing to the labour scarcity and the high prices of horses, harness, fodder, &c.; this difficulty has made it necessary for me to adopt many expedients in order to carry on.

The difficulties in regard to maintaining the roads heavily used by motor omnibuses having been brought to the notice of one of the principal companies has resulted in a curtailment of their services; in my opinion this traffic calls for serious consideration when times become normal again, and a new method adopted to meet the changed conditions created by the introduction of this traffic, which has undoubtedly come to stay.

LIGHT RAILWAYS ON MOTOR 'BUS ROUTES.

My idea is to lay a 20-in. or 24-in. light railway alongside all roads on which there is a successful motor 'bus route, and divert the traffic to these tram lines. Legislation would be required to widen roads in some cases and remove corners where necessary, although the necessity for this would not be great. Tram lines were largely used in Belgium before the war and were found exceedingly useful. The cost of making our main roads (of which this county has over 1,000 miles) strong enough to carry this heavy traffic would be a tremendous tax on the ratepayers, and it is my opinion that the adoption of these tramways would not only be economical but would make travelling on the roads much more pleasant for pedestrians, motor cars and wheeled vehicles.

Now is the time to consider all these things and formulate schemes; proposals of work will be wanted when demobilisation takes place after the war, and the Road Board have signified their intention to give financial assistance to approved schemes. I am aware that one of the chief difficulties will be the hills on many routes, which will require engineering skill and legislative powers to overcome.

FRICTION SCHEME.

With regard to the scheme included in the estimate for the year 1915-16, to resurface various sections of main roads with Tarmac and tarred macadam (a total of thirty miles), towards which the Road Board agreed to contribute £5,867, this is still incomplete, owing to the shortage of labour and the fact that the contractors have been mainly engaged on orders of more urgent national importance. The whole of the grant will be forthcoming when the requisite tonnage is consolidated.

The scheme of surface tarring of the main roads during the past season was performed by direct labour, the work being distinctly superior to that done by contract in previous years. Various difficulties arose, mainly through the wet season and labour shortage, which made it impossible to carry out the scheme in its entirety. The Road Board contributed a moiety of the actual expenditure incurred.

WORKS AFTER THE WAR.

In order to provide employment when the occasion arises, five schemes of road improvement in various parts of the county have been prepared; at the invitation of the Road Board I attended a conference of county surveyors in London on this subject, and the Board have signified their willingness to render monetary assistance in furtherance of this object. Employment will be found for a large amount of labour in remedying the result of the past and present enforced economy on the roads in many directions, and much careful forethought is necessary in order that the expenditure incurred may lead to reducing the cost of maintenance in years to come.

RURAL ROADS.

The total cost for rural roads for the past year has been £61,717, or an average of £63 17s. 10d. per mile, inclusive of salaries, improvements, bridges and footways.

* Extracts from Annual Report.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRY HELD.

Middlesbrough T.C. (May 16th. Mr. P. M. Crosthwaite).—£12,850 for improvements in the Stockton-road to be carried out after the termination of the war. The thoroughfare in question extends from West-lane at Newport, to the boundary of the borough of Thornaby, a distance of 1 mile, and is the direct connection between Middlesbrough and Stockton. The town council propose to raise and pave the road, and widen the carriageway to 43 ft.

APPLICATIONS FOR LOANS.

Sheffield T.C.—£15,000 for electricity sub-stations.

Stafford T.C.—£8,700 for a new boiler at the electricity works.

Walsall T.C.—£3,200 for road repairs.

LOANS SANCTIONED.

Cardiff T.C. £1,185 for the Hayes electricity sub-station extension.

Dublin T.C.—£26,434 for the erection of seventy-five working class houses on the Spitalfields site.

West Ham T.C.—£1,500 for rebuilding a school at West Silvertown.

Salford's Rules for Dealing with Refuse.—The Salford Corporation are issuing a notice to the burgesses advising the adoption of six rules for dealing with domestic rubbish. These are: (1) Burn all dirty paper, vegetable waste, and general kitchen refuse; (2) clean all cinders and put the dust only in the ashbin; (3) do not put clean paper and cardboard boxes in the bins, but hand them to the refuse collectors; (4) burn all garden refuse (in Salford the collectors have instructions not to remove it). (5) do not sweep dust and paper from shops or houses into the street; and (6) as refuse is a danger to public health (especially is it a danger to the lives of young children), and also a haunt of flies in the summer time, keep the ashbins covered.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

When will the public realise that waste at the present time is a criminal action? Do they realise that if everyone saved a match a day, it would mean the value of a battleship in one year? Do they realise that, taking Birmingham alone, if every householder reduced the amount of their house refuse at present throw into the dustbin by only 1 lb. a day, it would save the rates of that city £13,000 a year? Do they realise that if every man, woman, and child saved, or collected, 1 lb. of waste paper a week, it would be worth more than £1,000,000 in a year? Shall we ever realise that there are fortunes to be made by saving our wastes?

* * * *

Is it a fact that at present there is only about five months' supply of timber in this country; and if this shortage is to be met, is it not a good suggestion that reinforced concrete can in many directions take the place of timber? In connection with this, have the experiments which have recently been made with reinforced concrete railway sleepers proved a success, or are the sleepers still insufficiently resilient?

* * * *

Does it not seem to be rather a pity that the well-known rookery in the promenade at Cheltenham has been destroyed by a ruthless demolition of nests, eggs, and young birds? Was this done because rooks are supposed to eat grain which is now becoming so precious in this country? And is it not a matter of some dispute among naturalists as to whether rooks do not prefer harmful insects rather than grain, and thus actually do more good than damage to agriculture?

* * * *

Is it not another nail in the coffin of waterbound macadam roads when we read that owing to the lack of horses the streets of the metropolitan borough of Lewisham cannot be watered, and that, according to the statement of a councillor at a recent meeting, in some of the streets "the dust is something abominable"? Is it not evident that such dust-manufacturing streets are doomed, and will in process of time become prehistoric?

* * * *

Is it not exceedingly interesting to read that a corps of civil engineers called the Zappatori, who are drawn from the cream of the engineers in Italy, and are attached to each infantry company, have been employed on the Italian front since the commencement of the war? Is it not well known that owing to their skill roads and bridges in almost inaccessible mountain regions have been constructed and maintained in a marvellous manner? Have we not aimed at doing something of the same kind by the recent employment of Mr. Maybury and other road engineers at the front, and could not this precedent be followed with advantage in other directions?

* * * *

Will not all engineers, not only in this country but almost all over the world, mourn the loss which the profession has sustained through the death of that veteran engineer Sir Alexander Binnie? Does not his death, following so closely upon that of Mr. Baldwin Latham, sever another link with a generation of sanitary engineer giants who have done so much for the welfare of the human race? But as these thinning ranks can be filled by a younger generation for the continuation of the good work, are we not able to say, "Le Roi est mort; vive le Roi"?

* * * *

Is it not rather disappointing to find that, according to Prof. F. S. Reid, there is no powder or other substance which, if placed in a dustbin, will prevent the breeding of flies, but that the best remedy against this dangerous pest is to burn all vegetable and animal refuse in the kitchen fire? Will not householders find it difficult to do this, however, now that gas-fires have so generally taken the place of the old-fashioned kitchen ranges? Is it not somewhat comforting, however, to find that Prof. Reid suggests the daily application of kerosene to horse refuse, and subsequent sprinkling with chloride of lime? After all, is it not now pretty clearly understood that scrupulous cleanliness of one's surroundings is the best remedy against the fly peril?

* * * *

Is it universally known that quicklime can be used instead of explosives in disrupting large masses of concrete or brickwork where blasting cannot with safety be carried out? Is it not interesting to find that this is effected by drilling holes about 2 in. in diameter, filling them with dry quicklime, adding a little water and securely plugging the hole, when the irresistible action of the expansion which follows splits the mass in every direction? What is the action that causes this expansion? Is it purely chemical, or is it mechanical?

WHERE INTUITION FAILED.

Intuition proved a poor substitute for the transit on a piece of work done recently in a certain American city. A railway company was eliminating a level crossing and had asked the city engineer to locate the sewers and water mains so that piles to support the tracks temporarily could be driven without injury to the underground structures. The city engineer, without the aid of a transit, indicated the proposed centre line of a sewer and told the engineer for the railway

company that he could drive his piles 3 ft. either side of the line without damaging the sewer. To be safe, the railroad engineer moved 4 ft. over—and the condition shown in the accompanying photograph—which we reproduce from *Engineering News-Record*—is the result. An interesting point is that neither the man driving the piles nor the city knew the sewer had been penetrated until a separate investigation had been made.

FLY EXTERMINATION.

A BACTERIOLOGIST'S ADVICE.

In the course of a recent meeting of the Cheam, Surrey, Parish Council, the question of how to mitigate the nuisance caused by flies was introduced by Mr. C. J. Marshall, who said he had written Prof. F. S. Reid, the bacteriologist, on the subject, asking whether there was any substance in the form of a powder which the dustmen could place inside dust-bins to prevent the breeding of flies, and whether the pest could be prevented by keeping dust dry and vegetable refuse apart from ashes. The reply was to the effect that there was no such powder, but that if householders could be induced to keep ashes separate from other refuse and burn all vegetable rubbish and tea leaves there would be fewer flies in their houses. As a precaution Prof. Reid suggested the daily application of kerosene to the rubbish and sprinkling with chloride of lime. The professor urged the importance of keeping all foodstuffs covered up, especially milk.

Surveyors' Institution: Annual General Meeting.—The annual general meeting of the Surveyors' Institution, to receive the report of the council and the announcement of the result of the election of officers for the ensuing year, will be held in the lecture hall on Monday, June 4th, at 5 o'clock. The prizes awarded to successful candidates in connection with the recent preliminary and professional examinations will be presented by the president at the annual general meeting.

CORRESPONDENCE.

Ῥᾳ̈ς ἀνὴρ οὐ πάντ' ὁρᾷ

(One man does not see everything.)
—EURIPIDES.

NEW INVENTIONS.

To the Editor of THE SURVEYOR.

SIR,—The need for inventive faculty was never greater than it is to-day. In every department of industry new ideas are being put into practice with success to a greater or lesser degree, and if we are to keep pace with trade after the war we shall want all the developments possible. In municipal work especially we want development of ideas and inventions which shall reduce the cost of the public services, or make them more efficient, as municipalities are probably the biggest customers for a large number of trades. There is, however, a very serious gap between the inventor and the user. Some inventions may be put on the market which are absolutely worthless, but their use is obtained by a considerable amount of worry to the detriment of the users; while, on the other hand, good inventions are sometimes allowed to drop because their inherent value is not sufficiently realised, or it may be that no means exist for the proper trial of such inventions—to the loss of the community.

How, then, can the gap be filled? I have given a considerable amount of thought to the subject, and I think I see daylight at last. I have come to the conclusion that the want may be met by the setting up of a Board of Inventions, or whatever one likes to call it, composed of a body of men whose standing is such that an expression of opinion on the value of an invention by them shall carry weight, and whose opinion in course of time would be sought by not only those who seek to place inventions on the market, but also those who desire to use any particular invention. I feel sure that not only inventors would welcome such a board, but also municipalities and manufacturers. The board would not only act in an advisory capacity, but would also undertake the necessary investigations, with the assistance of professional men and manufacturers who make a speciality of the work to which a particular invention applies. I cannot say more just now, because the matter has already been discussed at an informal meeting—convened by me—of representatives of civil, mechanical, electrical, gas and municipal engineering; also of chemistry and public health, and the views of those attending have been laid before a number of professional societies, who have been asked to appoint delegates to a future meeting. All the replies have not yet come to hand, but some of the delegates have been appointed, and the views of your readers—professional and manufacturing, inventors and users of inventions—would be welcomed. I therefore ask for expressions of views as early as possible. As, owing to the war, my Westminster office is closed, all letters should be sent to me either at Southall or care of the Editor of this journal.—Yours, &c.,

REGINALD BROWN, M.INST.C.E., M.I.MECH.E., &c.

Southall, Middlesex.
May 19, 1917.

THE GOODS CLEARING-HOUSE SYSTEM.

To the Editor of THE SURVEYOR.

SIR,—As you were good enough to give a notice of the paper I recently read advocating this system as the remedy for congestion of goods traffic on railway lines, may I be now permitted to point out that the existing trouble is due to the gradual growth of traffic, which now assumes gigantic proportions, rather than to any neglect of management at any particular time? Great increase in the population and proportionate increase in goods traffic has led us to drifting imperceptibly into ways which, though possibly tolerable on a small scale, are intolerably bad on a large scale, and have led us to suffer enormous losses.

Dr. Hele-Shaw, who opened the discussion on my paper, very clearly indicated the insidious nature of the disease—congestion—from which we suffer. The extension of sidings and shunting-yards has now reached alarming proportions, and can only grapple slowly and ineffectually with the increasing requirements.

A multiplication of harmful remedies will never cure the disease. Is it not time we looked to science and up-to-date methods to help us out of the difficulty?

The Board of Trade has refused to examine into and report upon the Goods Clearing-house System. But why? A few years ago the street-widening scheme was brought forward and received the greatest attention—why deny the same treatment to this system, which is really scientific, and has the approval of engineers and scientists of the highest position?

I can assure you that any friction which may have arisen is due not to the inventor, but to those who have systematically banded themselves together, not only to decry and pooh-pooh the system itself, but to ignore the opinions of the experts who have examined and reported on it.

As an Englishman, Mr. Gattie is entitled to fair play: why not look into the system? If it is only half as good as all those who have examined it declare it to be, an almost inconceivable benefit will have accrued to this country, and if it is "impossible" and "impracticable," as those who refuse to examine it so positively aver, then we shall at least have the satisfaction of knowing that we did not let the chance of securing something good pass us by unchallenged.—Yours, &c,

HEADLEY.

London.
May 17, 1917.

CHEMICAL KNOWLEDGE IN SEWAGE DISPOSAL.

To the Editor of THE SURVEYOR.

SIR,—I am greatly obliged for your kind and appreciative notice of my paper in your issue of May 18th.

I am glad to know that you are disposed to agree with some of the ideas which I have ventured to set forth. I would emphasise the point, for which you plead, namely, the greater use of chemical knowledge in the disposal of sewage. Nothing could be sounder, and the simplest and most striking instance is found in your own columns on page 464, when you quote the excellent work of Mr. J. Garfield, who, knowing that sulphuric acid was necessary for the "cracking" of "suds," as stated in my paper, foresaw the shortage of sulphuric acid, and secured quantities of nitre cake.

I take off my hat to Mr. Garfield, and with best thanks to you, I am, yours, &c.,

BERTRAM BLOUNT.

76-78 York-street, Westminster.
May 22, 1917.

PURCHASE OF CHARS-A-BANCS BY THE GOVERNMENT.

The Commercial Motor Users Association has for some time past been in negotiation with the proper Government authorities as to the possibility of sale to the Government of motor chars-à-bancs which have been lying idle since the Order in Council of August last prohibiting the use of motor spirit in chars-à-bancs. Whilst no guarantee can be given that sales will result, the association is authorised to collect the following information in respect of each vehicle in an official list:—

(*a*) H.P., type, make, and date of manufacture of chassis;
(*b*) Total mileage to date, and general condition of vehicle;
(*c*) Class of body and seating accommodation;
(*d*) Where chassis can be inspected.

The association is also authorised to state that, in cases where motor chars-à-bancs chassis have been taken by the military authorities, and the chars-à-bancs bodies left on the owner's hands, particulars of such stocks of bodies will also be considered, with a view either to (*a*) purchase or (*b*) compensation.

Owners of chars-à-bancs who are desirous of availing themselves of the opportunity are requested to communicate with Mr. Frederick G. Bristow, F.C.I.S., secretary, Commercial Motor Users Association, 83 Pall-mall, S.W. 1.

"Pudlo."—We have received a communication stating that the pumping station connected with the sewerage at Bedford, which hitherto was a source of trouble owing to flooding in the rainy season, has now been remedied with Pudloed cement. Our informant writes that the engineer has expressed his appreciation at the result, as the situation of the work presented great difficulties.

Staffordshire Main Roads.*

By JAMES MONCUR, M.INST.C.E., County Surveyor.

In Staffordshire the long period of wet weather experienced throughout the first six months of the financial year not only told severely on the roads, but also interfered very considerably with the Tarvia grouting and tar-spraying work. The weather during the winter months upset road work generally. The snowfalls did not affect the traffic very much except in the northern part of the county, where drifts formed completely blocking the roads. These were, however, soon cleared by the surface-men with the assistance of extra labour. The continuous grooves formed by the traffic following one line on some of the roads during the frost and snowstorms will entail a good deal of careful and patient labour on the part of the surface-men before they can be wholly eradicated. The parts of the roads that remained covered with frozen snow were not exposed to the same extent to the damaging action of the frost. It, however, penetrated to a considerable depth into roads that were not so protected, and some of them, particularly on wet clay subsoils, were somewhat shaken when the thaw set in. The damage done, however, was trifling to that experienced in 1895, which not only points to the roads being stronger, but also to the great advantage of drainage, and especially subsoil drainage, which has been overtaken from time to time.

In previous reports I have mentioned the fact of the snow disappearing much more quickly from surfaces that had been treated with Tarvia. As the frosts of the past winter have been more intense than any experienced since this material has been used for binding the metal, I kept the roads so treated under close observation to see what effect the frost would have on them compared with roads that had been repaired by the old method, and it was gratifying to find that they proved far less liable to injury by its damaging influence. No doubt the effectual sealing of the surface with the bituminous binder, thereby forming practically a waterproof carpet, very largely, if not entirely, accounts for the satisfactory result.

It can therefore now be confidently stated that the results obtained justify to the fullest extent the extra initial cost, taking into consideration the greater resistance to the destructive effects of both traffic and adverse weather conditions. The Tarmac coatings were also unaffected. The only objection which can now be raised is certainly the somewhat serious one that the surface gives less foothold to horses. The London horse traffic, however, demonstrates conclusively that horses in time will get accustomed to the new conditions. Of course it must be quite understood that although Tarmac, and metal grouted with Tarvia, may be sufficient to carry the traffic satisfactorily on a very large mileage of county roads, there are exceptionally heavily-trafficked roads on which nothing short of paving will carry it. Owing to the fact that the tar spraying last year (1916-17) was almost entirely confined to the spraying of old Tarvia coatings and to the fact that spraying only lasts one year on heavily-trafficked roads, there were no means of judging the effect of frost on such surfaces.

PATCHING.

The reduced quantity of metal being used at present on the roads, and the concentration of it on particular roads, has increased the mileage to be maintained by patching. A good deal was done in Tarvia patching during the summer months, and in a few cases, as previously stated, the surface was tar sprayed as well, but unfortunately, owing to adverse weather conditions, together with the difficulty in procuring materials and labour, there is a considerable mileage not dealt with which is far from satisfactory. The months also in which ordinary patching is usually carried out were held in the grip of frost, and consequently such work as could have been overtaken was held up, and unfortunately the period between the break of the frost and the months of drying winds was far too short to enable this work to be done. The surface of some of the roads is therefore rougher than otherwise it would have been, but every effort will be made to improve matters at the earliest possible moment with Tarvia patching.

Notwithstanding the lower standard at which the roads have generally been maintained throughout the county, the complaints that have reached my office during the year have been few indeed, which is no doubt due to the travelling public realising the difficulties that have had to be contended with.

LABOUR.

The largest number of surfacemen employed in one fortnight was 194 and the fewest 158, whilst the staff averaged 174. Although fewer men have been employed than formerly, closer supervision has been necessary, and at no time more than now has the invaluable gift of tact been necessary to get the work properly overtaken.

Practically the whole of the younger men have either joined the Army or gone into munition works, whilst others left to construct camp roads, others obtained work in collieries, and others joined the Road Service Corps in France. Some of the men ultimately returned to the county service, but the vacancies, so far as we have been able to fill them, have been filled with men well advanced in years, and unfortunately many of them have had no previous experience of road-work. The work has therefore had to be carried out with not only a greatly depleted staff, but with somewhat inferior labour. The general surface-work is not only therefore much in arrears, but owing to enforced neglect many roads have deteriorated very considerably. The results of the past two years have demonstrated the need and great importance of manual labour day by day on the roads.

MATERIALS.

The weather troubles of the year were only secondary to the difficulties in getting the road materials supplied and carted. In some cases when quarry owners were in a position to supply, railway wagons or canal boats could not be got to convey the metal, and in others when wagons or boats could be had quarry owners could not supply the metal, and in cases where the supplying contractors could forward and the railway company or canal boatmen convey, difficulties arose in getting the metal carted to the road. It is pleasing, however, to report that with tact and perseverance we were ultimately able to obtain the whole tonnage of foreign metal estimated for.

FOOTPATHS.

There having been so little gravel prepared in pits for carriageways, the residue or fine gravel suitable for paths has been small in quantity, and as a sum was provided for this work in the estimate the opportunity was taken of procuring kerbing and channelling in places. Such work forms an abutment to the road, thereby materially increasing its strength, and in the case of Tarmac or Tarvia grouted metal, it prevents "creeping" or lateral movement.

CONTRACTS.

The tenders sent in at the beginning of the year were fewer in number than usual, and for the first time were in excess of the estimate. The following are the average rates over the whole county, and for comparison the previous year's rates are given as well:

	Contracted local materials Leek district, average rate per cub. yd.	Foreign metal supplying, average rate per ton.	Foreign metal carting, average rate per ton.
	s. d.	s. d.	s. d.
1915-16 ...	5 2 ...	10 6 ...	1 6
1916-17 ...	5 2 ...	11 1 ...	1 11

A fairly accurate comparison can be made of the carting rates, but in the case of supplying the same cannot be said as the rates per ton vary from 9s. 1d. to 13s. 2d., and a large proportion of the low-rated metal in one year would bring down the average rate compared with a year in which a larger proportion of high-rated metal had been used.

The practice of contracting for local materials, as far as possible, has been continued, as well as for footpath materials, kerbs, tar-spraying materials, &c. In carrying out these, 189 separate contracts have been negotiated and entered into during the year.

* Extract from report for 1916-17.

ANNUAL REPORTS.

The Editor will be glad if readers will forward regularly to him copies of their annual reports.

SEWAGE DISPOSAL IN THE WANSTEAD (ESSEX) URBAN DISTRICT.

By Edward Lindon,
Works Manager.*

The area of the Wanstead urban district is 1,688 acres and the population 15,000. The dry-weather flow (twenty-four hours) is 500,000 gallons.

The sewage disposal works occupy about thirty acres out of a total of forty-five acres of land owned by the council. From about 1885 until 1913 the sewage purifying works consisted of two detritus tanks 30 ft. by 12 ft. by 4 ft. deep (these were cleaned out by means of hand pumps); two septic tanks 100 ft. by 56 ft. by 7 ft. 6 in. deep; contact beds (six until 1905 when six new beds were constructed, making twelve in all); storm streaming filter 480 ft. long, 20 ft. wide; irrigation land, 14 acres.

About the year 1910 it was found that the effluent in the discharged into the river was not satisfactory, owing to the contact beds having become very foul and the irrigation land being sewage sick. Messrs. Willcox and Raikes, of Birmingham, were consulted, and subsequently submitted a scheme for the treatment of sewage by the bacterial filter process. Their scheme was adopted and the work of reconstruction commenced in May, 1913, and about the middle of October, 1914, the distributors were run for the first time.

AND THE NEW.

The sewage on arriving at the works, passes through a storm overflow chamber. In this chamber a weir is fixed over which all sewage exceeding six times the dry-weather flow passes direct to the storm tanks. Any volume up to six times dry-weather flow must go through the detritus tanks. These tanks are in duplicate, the measurements being 24 ft. by 8 ft. by 4 ft. 6 ins. deep (from invert of sewer). The walls are 14 ins., built of London stock bricks and finished with blue coping.

The machinery connected with the detritus tanks was supplied by Messrs. Hartley, Sons, & Co.

SEDIMENTATION TANKS.

Originally these were two covered septic tanks. These were converted into four sedimentation tanks when the works were reconstructed. Each tank is 100 ft. long by 27 ft. 6 in. wide, 8ft. 9 in. deep at the inlet end and 7ft. 6 in. at the outlet, and has a capacity of 121,000 gallons, or, in other words, the four tanks will hold twenty-two hours' dry-weather flow. The floors (which have a fall of 15 in. to expedite the drawing off of the sludge), and also the outer walls are of concrete construction, while the division walls consist of blue brickwork. The roofs, still remaining since the septic tank days, are composed of rolled steel joist and concrete.

The tanks are so arranged that they can be worked on the parallel or series system. It is found that the best results are obtained by working three tanks in series and keeping one tank in reserve for storms, which it is put into operation to keep down the velocity of the sewage passing through the series tanks. The tanks are cleaned out about once a month, and for drawing off the supernatant water Adams' patent decanting valves are provided. The sludge from all four tanks gravitates to the main sludge well, which is 11 ft. square.

Before reaching the filter beds the sedimentation tank effluent passes through a Dortmund tank 24 ft. square, 19 ft. deep and having a capacity of 41,500 gallons. Here further precipitation takes place, the sludge being drawn off through a 6-in. cast-iron pipe, which discharges into the main sludge well. The effluent leaves the tank over a weir in a very thin film, passes through a strainer consisting of a 12-in. layer of small clinker, and thence to the distributor bed (reached by means of a 21-in. pipe carried along the floor of the filter bed).

PERCOLATING FILTER.

Owing to the very little fall available and to save the necessity of pumping, it was necessary to construct the percolating filter below ground-level. The surface of the bed is about 5 ft. below the surrounding land. The bed itself is 200 ft. by 180 ft., having an area of 1,000 yard, square, and containing about 6,600 cubic yards of clinker, the average depth of this being 5 ft. This was graded to four sizes, the largest being 3 in., and the smallest ½ in. The floor and walls are constructed of concrete, the walls being finished off with blue coping.

The distributors are the rectangular type, four in number, and are power-driven. Each has a span of 48 ft., and the distributing tubes (which are cast-iron) are each fitted with forty-eight nozzles, spaced 12 in. apart. At the present time half these only are in operation, the others being blanked off. It was found that by increasing the size of the hole and reducing the number a much larger spray was obtained, the result being a much better aeration.

At the present time the distributors are discharging at the rate of 157 gallons per square yard per twenty-four hours, or in other words dealing with 311,040 gallons per working day of twelve hours. The running costs, at 1½d. per unit for current (pre-war price), work out at about 10s. 6d. per million gallons. The distributors are coupled up in pairs by means of wire ropes, each pair being driven by a 4-h.p. motor. I might here add that the distributors travel at a speed of 60 ft. per minute.

The distributors, together with the winding engines, reversing gear, and motors, were supplied by Messrs. Hartley, Causton and Richmond, Limited, Stoke-on-Trent.

CONTACT BEDS.

The old contact beds are still found very useful for dealing with the greater portion of the night flow and for any volume in excess of that required for the distributors. These beds are twelve in number, each 60 ft. by 45 ft. by 4 ft. deep, and each contain about 450 cubic yards of clinker. The effluent from these beds is discharged on to one or the other of the irrigation areas before finally reaching the river.

STORM WATER TANKS.

The storm tanks are three in number: one detritus tank, 93 ft. long by 19 ft. 6 in. wide by 8 ft. deep, and two secondary tanks, each 193 ft. long by 20 ft. wide by 5 ft. 6 in. deep, and three tanks having a total capacity of over 200,000 gallons.

SLUDGE LAGOONS.

These are five in number, each 84 ft. by 36 ft., and having a total area of 1,680 square yards. They have earth banks and concrete floors, and are underdrained with 4-in. agricultural drain-pipes, which discharge into brick chambers built in the earth banks which separate the beds. Each bed contains as a drainage medium a layer of clinker 18 in. thick. Sectional weirs are provided for drawing off the supernatant water, which, together with the under-drainage, is returned to the sedimentation tanks for further treatment.

Narrow-gauge rails and tip-wagons are provided for removing the dried sludge, which at the present time is being used for filling up unlevel ground on various parts of the works. If the weather conditions are favourable, six to seven weeks is the time required for drying the sludge.

SLUDGE PUMPING.

The liquid sludge from the sedimentation tanks is dealt with by means of a 4-in. stereophagus pump, supplied by the Pulsometer Engineering Company, Limited. This pump is direct-coupled, electrically driven, has a speed of 1,300 revolutions per minute, and is capable of discharging 230 gallons per minute against a head of 27 ft. The motor is a 10-h.p. direct-current type. The pump is 6 ft. below ground-level. A 6-in. cast-iron rising main carries the sludge to a chamber above surface level of the sludge lagoons. From this chamber the sludge gravitates to any of the lagoons as required. The cost of pumping works out at about 7d. per hour.

About eleven acres of land are still available for the treatment of the contact beds effluent. This land has not been ploughed up for several years. About three crops of grass are obtained from this land every year. The amount realised from the sale of grass last season was about £84

* Extracts from paper prepared in connection with a meeting of the Association of Managers of Sewage Disposal Land on the 12th inst.

The Summer Time Act.—In reply to a question as to whether consideration would be given to the advisability of further extending the advantages of the daylight-saving system by utilising a second hour during the period of the longest daylight, so as to produce a maximum of economy in national resources, Sir G. Cave, the Home Secretary, stated on Monday in the House of Commons that the question was considered by the Departmental Committee, but they reported adversely to the proposal. Very few suggestions in favour of this course were received by them, and they were of opinion that it would lead to inconvenience and confusion. The Government did not propose, therefore, to take any steps in the direction suggested.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Atcham R.D.C.—The council have referred to the Sanitary Committee a suggestion, emanating from the Local Government Board, for a joint isolation hospital for the district area and for the borough of Shrewsbury.

HOUSING AND TOWN PLANNING.

Aberdare U.D.C.—The council have approved a housing scheme, at an estimated cost of £5,000. The houses will be built at Abernant.

Clayton U.D.C.—The council have appointed Mr. W. Carby Hall architect and surveyor of the proposed town-planning scheme.

Coventry T.C.—The city council on Wednesday last referred back to committee a recommendation with respect to the housing scheme in London-road. The Government, it was stated, had decided to erect 208 cottages and six shops, the local authority to take the houses and shops over at mid-summer, five years after the declaration of peace, at the then existing market value of the property, to be determined, failing agreement by the parties, by the Local Government Board, or a person nominated by the board.

Greasborough U.D.C.—The council have approved a report by a sub-committee recommending the provision of working-class houses.

Llanfrechfa Upper U.D.C.—The council have approved the resolution of the Aberdare Urban District Council in favour of legislation to enable local authorities to acquire land for housing and town planning on reasonable conditions.

Tiverton T.C.—With reference to a return asked for by the Local Government Board with regard to works contemplated after the war, the town council have decided to reply that they propose to proceed with the next stage of their housing scheme if the financial conditions are sufficiently favourable and the need of further housing accommodation is then found to exist.

MOTOR TRANSPORT.

Abersychan (Mon.) U.D.C.—It has been agreed to purchase a second-hand motor car for the use of the fire brigade.

Atcham R.D.C.—The Highways Committee have been asked to consider the purchase of a tractor with trailer, at a cost of about £700.

Manchester T.C.—The Finance Committee have sanctioned a proposal of the Cleansing Committee to spend about £700 in the purchase of a motor street-sweeper.

Portland U.D.C.—The surveyor, Mr. G. A. Waite, has been asked to report on the question of utilising the tractor for the collection of house refuse.

Shrewsbury T.C.—The town council on Monday adopted a recommendation of the Watch Committee that a municipal fire brigade should be established for the borough, and that the committee be authorised to take steps to acquire a motor fire engine and all the necessary equipment. The mayor (Alderman S. M. Morris) said the initial cost would be £1,300, towards which the Alliance and Royal Fire Offices (each of whom at present provide a fire brigade) would subscribe £600 and hand over their steam engines and equipment. The annual cost of maintenance would be about £300, equivalent to a halfpenny rate.

Skelmersdale U.D.C.—The purchase of a new motor ambulance is under consideration.

REFUSE COLLECTION AND DISPOSAL.

Brighton T.C.—The borough surveyor, Mr. H. Tillstone, in a report on the collection of waste food, waste paper and carboard, says: "The amount of paper collected with the trade refuse has fallen off during the last year to a very large extent, owing partly to the shortage of paper and partly to it being collected by the Salvation Army and other organisations. In May, 1916, 12 tons were collected per week, the contents of four pokes weighing 2 cwt. 3 qr. 7 lb. were examined, and the amount of paper obtained in the four weighed 2 qr. 14 lb., or 22 per cent of the whole, while the cardboard weighed 1 qr. 18 lb., or 14 per cent. On the 25th of this month, four pokes were again examined, the total weight being 2 cwt. 3 qr. 25 lb., and the paper weighed 17 lb., or just over 5 per cent, and the cardboard 1 qr. 5 lb., or practically 10 per cent. The amount of trade refuse collected at the present time is less than three tons per week. The amount of food fit for pigs in the refuse brought to the destructor is practically *nil*; in one load of 14 cwt. 3 qr. 10 lb. it amounted to 2 lb., and included portions of turnips, rhubarb leaves, the stalks of cabbage, &c. I cannot therefore recommend that any of the refuse collected be sorted, as the expense would be out of all proportion to the value of the articles mentioned."

ROADS AND MATERIALS.

Andover R.D.C.—The surveyor, Mr. J. Wormald, has been instructed to discuss with the county surveyor the question of the repair of the district roads owing to the diversion of traffic from the main to the rural roads.

Cheshire C.C.—The county surveyor, Mr. W. Holland, reported the result of his interview with the Road Board as to grants for 1917-18, to the effect that the grants unearned by the council for the financial year ending March 31st last amounted to £2,616, which amount would be brought forward and would also be available for the current year, and that in addition thereto the board were prepared to make further grants of £5,000 for the current year for tar-macadam and tar-spraying—total, £7,616. It was stated that the restricted expenditure of the past two years, coupled with the greatly increasing heavy traffic and bad weather, has told severely on some of the roads under direct control; on the whole, however, they were "holding their own," although the surfaces at times left a good deal to be desired owing to delay in carrying out the requisite patching, through shortage of labour and carting.

Dungannon R.D.C.—It was stated that only five tenders had been accepted in connection with sixty-four road maintenance applications approved of. The matter was referred to the Tyrone County Council, but it was stated that a new road scheme would come into operation nine months hence, and that in the meanwhile the county surveyor was in a position to attend to the works untendered for.

Greenwich B.C.—The Highways Committee recommend that the following roads be repaired with ragstone macadam: Blackwall-lane from Tunnel-avenue to Greenfell-street, at an estimated cost of £400; Charlton-road, at an estimated cost of £732; and Cemetery-lane, at an estimated cost of £476.

Isle of Ely C.C.—It was announced that the council have received "the very satisfactory sum" of £900 from the Development Commissioners towards keeping up the tarring of the roads.

Kent T.C.—It was reported that the Road Board were recommending the War Office to contribute a moiety of the estimated cost (£10,734) of the repair of the main road from Guildhall-street, Folkestone, to Risborough-lane, Cheriton, the Road Board also to grant a loan of £4,000, free of interest, for a period of three years.

Kingsbridge R.D.C.—The owner of the adjoining property having agreed to give a piece of land at a nominal rental, the council have decided to construct a length of new road entering Hallsends.

Petworth R.D.C.—It was agreed on Tuesday last to purchase a tar-spraying machine for £23 10s.

Thakeham R.D.C.—The surveyor (Mr. W. Forrester) reported that the extra cost in repairing highways owing to the damage caused by timber carting in the district during the past year was £218, and he estimated that the cost during the coming year would exceed that amount. The clerk read correspondence which he had had with a view to making a claim

through the Road Board against the Home Grown Timber Committee, and from this it appeared that the Government had not let the direct contract for the cartage of timber in the district, and therefore there could be no claim against the committee.

Southwark B.C.—It is proposed to renew 3,000 yds. of wood block paving in St. George's-circus and Gravel-lane.

SEWERAGE AND SEWAGE DISPOSAL.

Dromore West (co. Sligo) R.D.C.—The council have decided to consider a scheme for the improvement of the sewerage at an early date.

Wellington (Salop) U.D.C.—The surveyor, Mr. G. Riley, is engaged in the preparation of plans for a sewerage scheme.

WATER, GAS, AND ELECTRICITY.

Aberdeen T.C.—The Water Committee have resolved to apply for the certification of the city water-works under the Munitions of War Act. A report was submitted from the water engineer in connection with the rewashering of water taps. It was resolved to approve of the water taps being rewashered by the employees of the water department free of charge. Considerable discussion took place on the subject, and the reasons put forward were the scarcity of plumbers and the demand for water.

Alnwick R.D.C.—The Local Government Board have written with respect to the council's request for a loan of £1,725 for a water supply for Alnmouth, and they did not regard the present as a suitable time for the inception of new works. The inspector (Mr. M. T. Wilson) suggested that a manhole and tap might be provided in the main on a level with the manhole from Denwick drift. The village could then be supplied direct from Denwick drift for the greater part of the year, and when that was not sufficient the springs and reservoir of 250,000 gallons in reserve would automatically come into use.

Ashbourne U.D.C.—In intimating that they could not sanction the council's request for a loan of £3,000 for the provision of an auxiliary water supply, the Local Government Board stated that they would be prepared to arrange for a local inquiry if the council desired it. The clerk stated that he had replied to the effect that the board evidently did not appreciate the gravity of the position, as at present seventeen hours' continuous pumping provided the town with only twelve hours' supply of water. Any breakdown in the plant would at once cause a water famine in the town, and the council felt that if there was any further delay they would not be responsible for the consequences.

Cardiff T.C.—The Electric Lighting and Tramways Committee have decided, on the recommendation of Mr. Arthur Ellis (manager), to increase the price of current by another 5 per cent. Mr. Ellis mentioned that their coal bill was £11,000 more than last year, and there were other additional expenses.

Dromore West (co. Sligo) R.D.C.—Plans and specifications for an improved water supply for Enniscrone have been prepared by the engineer, Mr. Cavanagh, and have been forwarded to the Local Government Board for approval.

Lancaster T.C.—The nett profits of the gas department last year were £12,409, compared with £3,408 for the previous year.

Leeds T.C.—The nett profit of the electricity undertaking for the year ended March 31st last was £87,278, compared with £72,720 for the previous year. The working expenses last year were £109,155, as against £75,143 for 1915-16.

Llandudno U.D.C.—It is announced that there was a nett deficiency on the working of the electricity undertaking for the year ended March 31st last of £1,763. In the preceding year there was a loss of £1,331. The report has been referred back to the Electricity Committee with a view to their submitting a recommendation to the council on the subject.

Looe U.D.C.—It has been resolved to employ the services of an expert to inquire into the water distribution system. It was stated that there was plenty of water, but that serious complaints had been received of a deficient supply on the higher levels.

Southampton T.C.—The Electricity Committee have been asked to consider the plans of the borough engineer, Mr. J. A. Leather, for the extension of the coaling accommodation at the electricity works by the reclamation of a portion of the waste land on the western shore.

PERSONAL.

Dr. J. J. Butterworth, county medical officer of health of Lancashire, has been elected a member of the Royal Sanitary Institute.

Mr. James F. Read, of Belmont House, Winchmore Hill, has been appointed temporary deputy city engineer of Norwich, at a salary of £300 a year.

Mr. G. Riley, surveyor to the Wellington (Salop) Urban District Council, has had his salary raised by £30 a year, the increase to be in lieu of payments hitherto allowed for the preparation of plans for permanent works.

Mr. Philip Lyle Riviere, an engineer on the staff of Messrs. Kennedy & Donkin, was on Tuesday appointed, at a commencing salary of £1,200 a year, as electrical engineer in the London County Council tramways department.

Mr. W. Mellings, who has officiated as acting surveyor to the Ludlow Rural District Council, has asked to be released from office as soon as possible, owing to the pressure of his farming work. The council have asked him to reconsider his decision.

Mr. Joshua Cartwright, of Bury, who was president of the Institution of Municipal and County Engineers from 1892-3, celebrated his eighty-second birthday on Wednesday, and his numerous friends in the profession will be glad to know that he continues to enjoy excellent health.

Captain T. Salkield (city engineer of Delhi, India), who is attached to the Roads Corps in France, is to be congratulated upon having been honoured by Sir Douglas Haig in his dispatch of April 9th last. The dispatch, which appeared in the *London Gazette* of the 15th inst., recorded Captain Salkield's name as "deserving of special mention."

Mr. K. F. Campbell, borough engineer of Huddersfield, has been granted an honorarium of £500 in recognition of special work done in connection with the tramways and education committees and the sewage works, and the town council have decided to defer the question of an increase of salary pending the possible reorganisation of his department. It was stated by Alderman Woodhead that it was eighteen years ago since Mr. Campbell had any increase of salary, although the cost of his department had only increased by £500 in that period. When he came to serve the corporation he was not expected to be the architect for the Education Committee, but he had done a great amount of work in that direction. Largely through his efforts the sewage works had made a profit of £17,000 during the past year on the extraction of grease and the treatment of effluent.

Mr. William Marsh, tramways manager to the Brighton Corporation, has received a request from the Admiralty to undertake work in the Shipyard Labour Department for the period of the war. In their letter to the Tramways Committee the Admiralty write:—"Other important corporations and private firms have shown their recognition of the importance of the work to be undertaken by this new department during the present crisis by lending the services of valued officials to the Government, and have further added to our indebtedness by continuing the salary of the official so loaned. The Admiralty will be very grateful if your council will offer them similar assistance." The committee resolved that they had pleasure in complying with the request, and that Mr. Marsh be given leave of absence for the purpose of acting as an assistant director of shipyard labour. The committee have also passed a resolution congratulating Mr. Marsh on this honour and authorising him to make what necessary arrangements will be required for "carrying on" during his absence.

FOR OTHER ADVERTISEMENTS
See End of Paper.

O.H.M.S.

SURVEYOR'S CLERK and DRAUGHTSMAN. Applications, to be addressed to the Division Officer, R.E., Codford, Wilts, are invited for the above post. Rate of pay: 52s. 6d. per week, plus War bonus. Free single quarters.

Applicants should be ineligible for military service or Class C3. Experience of technical office work, specifications, and drawings to be stated. (3,418)

LAW QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as nom de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

THE CLEANSING OF CESSPOOLS: WATER SUPPLY.—"F. H." writes: Plans have been submitted for consideration by my council of twelve bungalows to be erected upon a site within the town, one a hut removed from our sewerage system and water distributing mains by about a mile. The lay-out plan for this estate was submitted to and passed by the council some twelve months ago. As far as the present plans indicate, it is intended to drain the whole twelve bungalows (and probably any more that may be erected) into a large cesspit, until such time as the council are able to extend their sewers to serve this area. The work of cleaning this large cesspit—in accordance with the practice that I find is adopted in this town—would fall upon the council. I am of opinion that this should be done by the owners of the property, but I cannot find any legal information bearing upon this point, and I should be very glad of your assistance in the matter. At the same time, will you kindly give me your advice in regard to the water supply to this area?

The council are not bound to undertake the cleansing of cesspools unless required to do so by order of the Local Government Board. And if they have not undertaken to do so they can make by-laws requiring the owners or occupiers to do so. See *Staniland and Holywell Green Industrial &c., Society* v. *Staniland with Old Lindley Urban District Council* (1906, 1 K.B., 233). If sec. 3 of the Public Health (Water) Act, 1878, is in force in the district, the owners can be compelled to bear the cost of bringing the mains within a reasonable distance of the property. But if that section is not in force the council will have to bring the mains within a reasonable distance at their own expense, and then proceed under sec. 62 of the Public Health Act, 1875.

HIGHWAY: GATES AND STILES.—"J. A. I." writes: A highway from a township to the sea beach is awarded under the award dated 1777 a width of 60 ft. to the low-water mark. The road, about 15 ft. in width, from the top to the bottom of the cliff, was washed away by heavy seas two or three years ago. A foot-track still remains. Across the road between the village and the top of the cliff there are several gates, and the owner of certain of these gates wishes to lock them and fix stiles for the foot-passengers at the sides. Will you please inform me if the council can enter into an agreement with the owner to allow him to do this on an arrangement being made for the supply of keys should anyone wish to use the road for conveyances?

In my opinion the council have no power to enter into such an agreement if the locking of the gates and the fixing of the stiles will make the road less commodious for the public. See *Bateman* v. *Burge* (6 C. & P., 391).

COMMITTEE ON ELECTRICAL SUPPLY.

LOCAL AUTHORITIES' REPRESENTATION.

On Monday, in the House of Commons, the President of the Board of Trade was asked whether the Committee on Electrical Supply contained only one representative of local authorities owning electrical undertakings, and whether he would grant more adequate representation to those interests.

Mr. Roberts, who replied, said that, apart from the one representative of local authorities on the committee, another member of the committee was consulting engineer to many local authorities owning electrical undertakings, and he as well as the representatives of the Local Government Board and of the London County Council might be regarded as interested in the local authority aspect of the electric supply industry. The committee proposed to take evidence from the various local authority associations, who would thus have ample opportunity of stating their views. In these circumstances there did not appear to be any occasion to place more members on the committee, which was already a large one.

Ilkeston Tramways Transfer.—The Nottinghamshire and Derbyshire Tramways Bill, which authorises the transfer of the Ilkeston tramways, belonging to the Ilkeston Corporation, to the Nottinghamshire and Derbyshire Tramways Company, came before a Committee on Unopposed Bills at the House of Lords on Wednesday. The Bill was passed by the committee, without amendment, and ordered to be reported.

SCOTTISH NOTES.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Scottish Notes," 24 Bride-lane, Fleet-street, E.C. 4.]

Town Planning Act Amendments. A large amount of useful work has been undertaken by the sub-committees appointed in February last by the Scottish Committee of the National Housing and Town Planning Council. The writer is led to understand that the Town Planning Sub-Committee has been in consultation with the Scottish Local Government Board, with a view to the amendment of the Town Planning Act and Regulations, with the object of simplifying procedure. Everyone who has had experience of the present long and tedious course which has to be followed before power is granted even to prepare a scheme will welcome this, and local authorities and all others interested in the successful operation of the Act will wish the committee every success in their laudable endeavours.

* * * *

Housing Design. *Apropos* a recent suggestion of the council that the Government by competition among architects should secure for the use of local authorities suitable designs for houses, the writer, while commending the council for its untiring efforts in behalf of housing reform, strongly deprecates the calling in of architects to the exclusion of the technical staffs of local authorities. In any competition which may be arranged, it is to be hoped that the Institution of Municipal and County Engineers will see that the interests of its members are safeguarded. It is admitted—with the greatest goodwill—that there is a large body of able architects well qualified to deal with the housing problem, and none will admit this more readily, or welcome their assistance with greater pleasure, than will the engineers to local authorities. At the same time a great wrong would be done municipal engineers were they excluded from such competitions. Many of these officials have made a long and careful study of the housing problem, and are well able to advise their respective authorities on the subject. In addition, many of them have had opportunities in the study and practice of town planning which are denied to architects, and as housing and town planning, to be successful, must ever go hand-in-hand, it is to be hoped this aspect of the question will be kept in view.

* * * *

Representation at Conferences. A joint meeting of the English and Scottish sections of the council is to be held shortly, when doubtless the result of the recent deputation to Lord Rhondda will be reported. In connection with this meeting and anticipated action, the writer presumes to issue a note of warning to local authorities and their officers. The National Housing and Town Planning Council now includes in its membership not only members and officials of local authorities and professional men interested in housing, but also representatives of trade unions and kindred associations. While welcoming all shades of opinion—and all are necessary to a proper solution of the problem—the writer has observed that at recent conferences there has been a slight falling off in the representation of and in the interest shown by local authorities, while on the other hand the representatives of labour are regular in attendance and eager in discussion. Present circumstances no doubt make the attendance of members of local authorities difficult, and many officials are, of course, on war service, but if the housing policy is to be shaped in keeping with the needs and experience of local authorities the presence of their representatives at the conferences is not only desirable, but necessary. The men who take part in the discussions naturally help to colour and shape the policy; therefore the writer insists that at this joint meeting, where matters of very great and national importance are to be discussed, local authorities should not fail to be well represented.

THE TRIBUNALS.

The [illegible] and the city water engineer appeared before the Coventry Appeal Tribunal last week in support of the renewal of exemption for three [illegible] engaged in the waterworks department of the corporation. The borough engineer, Mr. J. E. Swaffield, C.E., stated that it was almost impossible to fill up vacancies already existing, and suggested that the water services were so vital to the interests of the city that there ought to be no further depletion of men.

The tribunal gave two of the men six months' conditional exemption, and the third man three months.

At the Lewes Tribunal on Tuesday last the East Sussex County Council asked for the conditional exemption of the assistant to the county surveyor. The county surveyor (Mr. F. J. Wood) appeared in support of the case and stated that the man was the only male assistant employed in the office. He contended that, as the man had been previously rejected and was now only in category C1, he was more useful in his present occupation than with the Colours.—The tribunal decided to allow three months' exemption.

At the King's Lynn Tribunal on Tuesday the Rural District Council resisted the appeal of the military authorities in the case of a sanitary inspector. The man had formerly been rejected, but he was now classed as A. It was stated (the *Eastern Daily Press* reports) that the man's duties extended over an area of twenty miles by ten miles, and that in addition to his ordinary work he had now been called upon to ensure the carrying out the work of food controlling. Conditional exemption was granted. The Lynn Corporation opposed the military in regard to an engineer employed at the Gayton Waterworks, and the military representative consented to the man being exempted for a further period of three months, on the understanding that the corporation would make every endeavour to train another man to take his place. A road surveyor in the service of the Norfolk County Council said he had 120 miles of main roads to see after. The county council did not support the man's personal opposition, and the military appeal was allowed. The man's application for time was refused.

HOUSING AFTER THE WAR.

LORD RHONDDA AND PRIVATE ENTERPRISE.

On Tuesday last Lord Rhondda, President of the Local Government Board, received a deputation representing practically all national associations interested in the subject of the housing of the working classes. The deputation urged that the Government should give encouragement to private enterprise and co-operative effort in the provision of healthy dwellings for the people.

Lord Rhondda said he fully recognised the great assistance rendered by private enterprise to the State in the direction of house building previous to the outbreak of war, and he would be sorry to see that enterprise stopped. He gathered from what had been said that the amendment of the Finance Act, 1910, as regards site duty, undeveloped land duty, and reversion duty, would restore confidence and bring about a resumption at work by private enterprise. The matter was a very urgent one, and they should have all their plans ready so that at the end of the war they would be in a position to put their scheme into operation. He regretted some figures had not been available as to the building there existed, there was evidently a falling off in such building before the Finance Act of 1910. He was interested to hear that private enterprise would be able, without any financial assistance from the State except by way of loan, to provide all the houses that would be required after the war at economic rents. Other opinions existed on that matter, but he was not going to make a declaration of policy. He would have to give every consideration to the arguments placed before him.

The Metric System.—The London County Council Education Committee on Wednesday adopted a recommendation favouring the compulsory introduction of the metric system.

PETROL SUPPLIES.

PUBLIC SERVICE REQUIREMENTS.

In the House of Commons the Prime Minister was asked whether he would consider the possibility of bringing under the survey of a single authority any restrictions on the horse-power and the petrol supply of persons requiring means of transit for the discharge of the duties of local government, so as to avoid the risk of their complete demobilisation by the independent action of separate authorities.

Mr. Roberts: The Prime Minister has asked me to reply to this question. The hon. member may rest assured that the need for maintaining, as far as possible, the necessary facilities for the discharge of the duties of local government and of other public services will not be lost sight of.

Sir R. Adkins: Can my hon. friend say whether the Government are willing to deal with this question systematically by arrangement with the Association of Municipal Corporations, the county councils, and the other local authorities, so that these may not be fettered by the inconsistent action of the different authorities, and in order that those who have local government work to do may know authoritatively that they can get the means to do it?

Mr. Roberts: Those matters shall be taken into consideration.

A CENTRAL PUBLIC HEALTH DEPARTMENT.

LOCAL AUTHORITIES' SUPPORT.

The Association of Municipal Corporations having considered the proposals to form a Ministry of Public Health their Law Committee will (states the *Times*) recommend the council of the association, who will meet on June 14th, to pass the following resolution:—

"That, inasmuch as the conservation and improvement of the public health call for the exercise of wide powers of local government touching the lives of the people at many points and involving questions not only of public medicine, but also of engineering economics and finance, and as these powers have been for many years entrusted to publicly elected bodies under the supervision and regulation of the Local Government Board, and under this system there has been a steady and progressive improvement in the health of the people. This council is of opinion that if any further consolidation or extension of public health powers is desired it should be attained by a development of the present organisation and the recognition of the Local Government Board as the Central Public Health Department."

INSTITUTION OF MUNICIPAL ENGINEERS.

GENERAL MEETING IN LONDON.

A general meeting will be held in London, at No. 4, Southampton-row, W.C. 1, on Wednesday, June 6th, at 6.30, when a paper, "House Refuse: Its Calorific Value and its Possibilities," will be presented for discussion by Mr. Reginald Brown, M.INST.C.E., M.I.MECH.E., F.S.I., F.R.SAN.I., &c.

The chair will be taken at 6.30 by Mr. Henry C. Adams, M.INST.C.E., M.I.MECH.E., F.R.SAN.I., the Acting President of the Institution.

INSTITUTION OF WATER ENGINEERS.

SUMMER MEETING.

The annual summer meeting of the Institution of Water Engineers will be held in London on Friday, June 22nd, commencing at 2.15 p.m.

A paper entitled "Colour Records Applied to Potable Waters" will be presented by Mr. J. S. Pickering, M.INST.C.E., of Cheltenham (past president), and a discussion on "Water Supplies as Sources of Power" will be introduced by Mr. Cecil H. Roberts, M.INST.C.E., of Aberdeen (member of the council). The premiums awarded by the council for papers read during the year 1916 will be presented to the respective authors, and the president will read a short report on the past year's working.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

ANNUAL MEETING: PROVISIONAL PROGRAMME.

The following are the arrangements which have been made up to the present in connection with the 44th annual general meeting of the institution, which is to be held at Hastings on June 28th, 29th, and 30th:—

Thursday, June 28th.

General business of the institution.

Presidential address and presentation of premiums.

Conference

Friday, June 29th.

Conference.

Lunch at the Town Hall, Hastings, by invitation of the Right Worshipful the Mayor of Hastings.

Visit to the Brede Valley Waterworks of the Hastings Corporation. Tickets, 4s. 6d. each.

Smoking concert at the Albany Hotel, Hastings.

Saturday, June 30th.

Visit to Battle Abbey, by kind permission of Sir A. Webster, Bart. Tickets, 4s. 6d. each.

PRELIMINARY LIST OF PAPERS.

1. "Public Abattoirs," by H. A. Brown, engineer and surveyor to the urban district council, Weston-super-Mare.
2. "Extraordinary Traffic and Excessive Weights on Highways," by H. T. Wakelam, M.INST.C.E., county engineer, Middlesex.
3. "Examinations," by E. Willis, A.M.INST.C.E., engineer to the urban district council, Chiswick.
4. "Dry Rot," by E. J. Goodacre, A.M.INST.C.E., assistant borough surveyor, Shrewsbury.
5. "Some Municipal Works of Hastings," by G. F. Miller, assistant borough engineer, Hastings.

The president-elect (Mr. P. H. Palmer) will be glad to receive offers to read papers at the meeting.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

WATER INSPECTOR.—May 28th.—Berwick-upon-Tweed Sanitary Authority. £2 per week.—Mr. A. Aird, clerk, 10, Sandgate, Berwick.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 2nd.—Eton Urban District Council. £150 a year.—Mr. J. E. Gale, 3, Sheet-street, Windsor.

ROAD FOREMAN.—June 4th.—Hendon Urban District Council. £3 10s. per week.—Engineer and Surveyor, Council Offices, Hendon, N.W.

SEWAGE WORKS FOREMAN.—June 4th.—Corporation of Halifax.—Borough Engineer, Town Hall, Halifax.

ASSISTANT SURVEYOR.—June 5th.—Wicklow County Council. £156 a year, with £20 for expenses.—Mr. S. J. Doyle, secretary, Courthouse, Wicklow.

SURVEYOR AND ENGINEER.—June 9th.—Sheerness Urban District Council. £300—£400 a year.—Mr. Vincent H. Stallon, clerk, Council Offices, Sheerness.

CLERK OF WORKS. For extensive camp sewerage scheme (irrigation system).—D.O.R.E., Blandford Camp, Dorset.

SEWAGE WORKS ENGINEER.—Doncaster Rural District Council. 34s. per week.—Mr. H. M. Marshall, clerk, 21 High-street, Doncaster.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

ST. HELENS.—May 30th.—For the erection of a boiler house and other works at a power station, for the Electricity Committee.—Mr. E. M. Hollingsworth, borough electrical engineer, St. Helens, Lancs.

WIVENHOE.—May 31st.—For the erection of a public library, for the urban district council.—Mr. R. H. Barrell, surveyor, Rectory-road, Wivenhoe.

HUDDERSFIELD.—June 1st.—For the erection of seventy-two workmen's dwellings, for the corporation.—Borough Engineer and Surveyor, 1 Peel-street, Huddersfield.

NORWICH.—June 7th.—For repairs to 22 houses, for the corporation.—Mr. A. E. Collins, city engineer, Guildhall, Norwich.

BURNLEY.—For internal alterations at the grammar school, for the Education Committee.—Mr. G. H. Pickles, borough engineer, Town Hall.

Engineering: Iron and Steel.

LINLITHGOW.—May 29th.—For the supply of about 360 tons of cast-iron pipes and special castings, chiefly 6-in. diameter, for the Linlithgow District Committee.—Messrs. J. and A. Leslie and Reid, engineers, 72A, George-street, Edinburgh.

SOUTHAMPTON.—May 31st.—For dredging work for the Harbour Board.—The Engineer, Harbour Board Offices, Southampton.

TYLDESLEY.—June 2nd.—For the supply of gas and water cast-iron pipes and specials, wrought-iron tubes and fittings, gas and water lead pipe, and prepayment gas meters, for the urban district council.—Mr. Mark Newsome, gas engineer, Gasworks, Tyldesley.

Roads.

STAMFORD.—May 31st.—For the supply of 1,500 tons of X-broken granite, for the corporation.—Mr. R. Ryman, borough surveyor and engineer, Town Hall, Stamford.

FAREHAM.—May 31st.—For the supply of granite, basalt, or other hard stone, for the rural district council.—Mr. J. F. Whitcar, surveyor, 18, Southampton-road, Fareham, Hants.

MONMOUTH.—June 4th.—For the supply of materials and for hauling broken and unbroken stone, for the county council—Mr. S. A. Bennett, county surveyor, County Council Offices, Newport, Mon.

Sanitary.

MELTON MOWBRAY.—May 30th.—For the construction of a sewer, about 350 yards in length, for the rural district council.—Mr. G. E. Fryer, Wyndham-avenue, Melton Mowbray.

NEATH.—May 30th.—For the drainage of 50 houses, for the rural district council.—Mr. W. D. Clason Thomas, Council Offices, Orchard-street, Neath.

THORNE.—May 31st.—For scavenging the town of Thorne, for the rural district council.—Mr. J. Stanley, surveyor, Orchard-street, Thorne, Yorks.

Waste Paper and Metals.—The British and Allies Waste Paper Company, 108 Stockwell-road, London, S.W. 9, are prepared to quote for waste papers, ledgers, catalogues, or any other kind of waste paper or metals, and to enter into contracts for the regular clearance of waste books, journals, newspapers, &c., from public libraries and other institutions.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance

CELBRIDGE.—For sinking a well and the erection of a pump, for the rural district council.—Mr. A. J. O'Connor, engineer, Council Offices, Celbridge, co. Kildare, Ireland.

John Grace, pump sinker, 124 Coombe, Dublin, £57
Thomas Cahill, pump sinker, Kildare, co. Kildare, £48
John Cromer, contractor, Lucan, co. Dublin, £51.
— Stevenson, Naas, co. Kildare (higher than any of above, but not considered, as not in accordance with specification).

NOTE.—Prices calculated on basis of sinking of 15 ft. through earth and 5 ft. through rock, which is, of course, purely empirical, and for the purpose of comparison of prices, which are made at rates per foot.

MIDSOMER NORTON.—For the supply of materials for the urban district council.

Quartzite and Limestone—S. C. Gibson & Sons.
Asphalt and Tarmacadam—Ebernoid Stone Company.
Team Labour—J. Simmonds.

SWANSEA.—Accepted.—For the execution of private street works, for the corporation.—Mr. J. Richards, M.Inst.C.E., borough engineer and surveyor, Guildhall, Swansea.

Emery & Co., Aston, Birmingham, £81

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

1.—Town Planning Institute: Adjourned discussion on Mr. Rees Jeffreys' paper, "Road Construction and Improvements by Means of Town-Planning Schemes." The Surveyors' Institution, 12 Great George-street, Westminster. 6 p.m.

4. Surveyors' Institution: Annual General Meeting. 5 p.m.

6.—Institution of Municipal Engineers: General Meeting in London. Mr. Reginald Brown, M.INST.C.E., on "House Refuse: Its Calorific Value and its Possibilities." 6.30 p.m.

21-22.—Incorporated Municipal Electrical Association: Annual Meeting. Institution of Civil Engineers, Great George-street, S.W.

22. Institution of Water Engineers: Summer Meeting in London.

26-30.—Institution of Municipal and County Engineers: Annual Meeting at Hastings.

29. Tramways and Light Railways Association: Annual Congress. Institution of Civil Engineers, Great George-street, Westminster. 2.30 p.m.

APPOINTMENTS OPEN.

COUNTY BOROUGH OF HALIFAX.
SEWAGE WORKS FOREMAN.

The Highways Committee of the Halifax Corporation invite applications for the post of Foreman at their Salterhebble Sewage Disposal Works, which consist of Precipitation Tanks, Sludge Pressing Plant, Contact Beds, and Percolating Filters.

Applicants must have had previous experience on a Sewage Disposal Works.

Applications, in candidate's own handwriting, stating age, experience, and salary required, accompanied by copies of not more than three recent testimonials, to be sent to the Borough Engineer, Town Hall, Halifax, on or before Monday, the 4th June.

(By Order)
PERCY SAUNDERS,
Town Clerk.

Town Hall, Halifax.
May 11, 1916. (3,416)

SHEERNESS URBAN DISTRICT COUNCIL.
APPOINTMENT OF SURVEYOR AND ENGINEER.

The Council invite applications for the position of Surveyor and Chief Engineer for their District which has an area of 840 acres or thereabouts, and a population estimated at 20,000. Candidates must be fully qualified to perform the ordinary duties attaching to such an office, and also to take the oversight of the Waterworks undertaking (the supply being from deep-well borings by means of air-lift ram pumps).

He must also have a competent knowledge of Sea Defences and Pier Maintenance Works.

The person to be appointed will be required to reside within the district, and devote the whole of his time to the duties of the office, and will not be allowed to engage in private practice.

Commencing salary will be at the rate of £300 per annum, rising by annual increments of £20 to £400 per annum.

Canvassing is prohibited.

Applications, stating age, qualifications, and experience, accompanied by copies of not more than three recent testimonials, and endorsed "Surveyor and Engineer," should be sent to the undersigned not later than Saturday, the ninth day of June, 1917.

(By order of the Council)
VINCENT H. STALLON,
Clerk.

[illegible] Offices,
[illegible].
May 16, 1917. (3,417)

WILTON HOUSE HOTEL
PRIVATE AND RESIDENTIAL,
ST. LEONARDS-ON-SEA.

[illegible] Annual Meeting of the Institution of Municipal and County Engineers to be held at Hastings, June 26-30, 1917, should book accommodation at this comfortable [illegible] to the Sea, Golf Links, Tennis Courts, Bowling Greens, Concert Rooms, Boating and Fishing.

159 Hastings. Proprietors: Mr. and Mrs. I. Newton Moss.

HASTINGS.

Queen's Hotel.

LEADING AND BEST.
CENTRAL POSITION
FACING SEA.

Telephone: 623.
Telegrams: "Queen's, Hastings."

ALBANY HOTEL, HASTINGS.

Chairman - - Sir Henry S. Lunn.

Finest position on the Sea Front. Away from traffic and trams.

HIGH-CLASS CUISINE. GARAGE.

Telephone: 116 Hastings. Manager: W. B. Lyth.

HASTINGS.

Waverley Hotel and Boarding Establishment.

Central Situation, two minutes from Sea and Station.

COFFEE ROOM. SMOKING ROOM. BILLIARD ROOM.

Terms moderate. Hotel tariff or en pension terms.

APPLY TO PROPRIETOR. TEL. 362.

The Surveyor

And Municipal and County Engineer.

Vol. LI. JUNE 1, 1917. No. 1,324.

Minutes of Proceedings.

Roads and Reconstruction.

The committee that has been appointed by the Cabinet to consider the numerous problems that will arise in connection with reconstruction after the war is performing a function of vital importance to the future of the nation. There appears to be some doubt, however, whether the terms of appointment are such as will enable it to recommend any action in regard to the improvement of the national highways. In one aspect, at all events, this is a matter which arises directly out of the war. Not only has military traffic placed a great strain upon the roads, many of which, owing to the mode in which they have been constructed, are ill fitted to bear this increased burden, but there will undoubtedly be a large permanent increase in the volume of heavy motor traffic when numbers of military lorries are released for ordinary work. Unless the revenue of the Road Board can be restored to something like the pre-war standard, the gigantic problem to be faced will clearly be beyond the means of that body. It was well recognised before the war that mere surface treatment is not sufficient. The root of the evil lies in unsatisfactory construction, both as regards crusts and foundations. There is also the financial difficulty that many highway authorities are unable or unwilling to incur the necessary cost of maintaining semi-main roads for through traffic, from which they derive little or no advantage. The fact is that only roads of the best construction can bear heavy traffic without excessive maintenance charges, and the provision of the funds for making such roads is a problem which must be faced by the Government without undue delay. In view of the grave importance of this question it is highly desirable that it should be made clear at once that the future of our national highways is a matter to which the Reconstruction Committee can and ought to devote their attention. But this is not all. We have before us a list of the members of the committee, from which it appears that it includes not a single person having any expert technical knowledge of highway construction. Mr. Sidney Webb, who is a member of the committee, possesses such a unique knowledge of the question in its social and economic aspects as will enable him to appreciate the force of our plea. But if any effective action is to be taken, the personnel of the committee should at once be strengthened by the inclusion of one or more leading experts in highway construction, and by the formation of a special sub-committee to deal with the matters we have indicated. Strong rumours are current as to imminent changes in the direction of the Reconstruction Committee, of which the Prime Minister himself is at present the nominal chairman, so that the time would appear to be opportune for strengthening the committee and widening its scope in the way we suggest.

* * *

Highway Organisation in Ontario.

Of the papers presented at the recent fourth Canadian and International Good Roads Congress, not the least interesting to British engineers was that by Mr. W. A. M'Lean, the Deputy Minister of Highways for Ontario, in which he outlined the existing highway legislation in force in that province. Historically, the method of financing construction and maintenance bears some resemblance to what has taken place in this country. Thus, the township councils originally depended largely on statute labour for road improvement, this system having been set up in 1796. From that time there has been a gradual evolution until the present day, when there is a real attempt to distribute the burden between the township, the county, and the province. Broadly speaking, there is now a threefold classification of roads. First, there are the local or township roads, each carrying the traffic, or little more than the traffic, which is created by the farms adjoining the road. These roads are controlled by and at the expense of the township councils, under a township superintendent. Next in order come the leading market or county roads—that is to say, the roads radiating from local market or shipping points—which carry a considerable accumulation of traffic. These are controlled by and at the expense of the city and county councils, aided by a graduated provincial subsidy. Lastly, there are the main roads between important cities and other terminal points, which are under the exclusive control of the Provincial Department of Public Highways. Provincial control is exercised over the second class of roads, which are planned subject to the approval of the Provincial Department of Highways, and must be built in accordance with their regulations. In fixing the respective financial liabilities it has been borne in mind that the building of expensive pavements within a city does not absolve the city from its obligations with respect to main roads in

the open country. City pavements are not designed for traffic requirements, but are expensive largely because of the advantages of kerbing and good boulevards to adjacent property, the cost being reflected in increased property values. Each city is consequently called upon to contribute to the cost of a certain mileage of radiating roads, the charge varying with local conditions. It will be observed that not only has the principle of main roads being considered as a national charge been recognised, but that a fairly elaborate system of graduated charges between township, county and province, with joint control, has been set up. Thus, beginning with statute labour, as this country did, the province of Ontario has arrived earlier at the goal of equitable highway finance. The example, in its broad lines, is one which might well be considered with a view to the adoption of a similar plan in the Mother Country.

* * *

Coal-gas or Petrol?

At a recent meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers a paper of considerable interest on the use of coal-gas as a substitute for petrol in the propulsion of commercial motors was read by Mr. W. C. Jackson, of Neath. In view of the shortage of petrol the question is one of immediate importance to those local authorities who have invested capital in the purchase of motor vehicles for various municipal services. Investigation has shown that, without any alteration in design, a petrol engine run with coal gas will develop something like 85 per cent of the power developed when run with petrol; while with engines designed for a higher compression the ratio would be even better. The chief problem, of course, is that of storage. It may be taken that 1,000 cub. ft. of gas are approximately the equivalent of 3 gallons of petrol. It is evident therefore that the storage of gas in sufficient quantities would require considerable space and would add a good deal to the dead weight of the vehicle, with a consequent increase in the running costs. As regards motor omnibuses, the problem has been solved by carrying the gas in a flexible collapsible holder on the top of the omnibus, this being firmly strapped to the roof. The problem as applied to lorries, however, is not capable of this easy solution, the only reasonable alternative being to store the gas in receivers under fairly high pressure. Even so, says Mr. Jackson, it is quite possible that coal-gas would show economical running, as a great deal of loss takes place with petrol engines where the power varies frequently from full load to no load, as occurs when numerous stoppages are made for the purpose of delivering goods, or in large towns from being held up in traffic blocks, due to the impossibility of maintaining under these conditions a proper admixture of air and petrol. The condition of the atmosphere in any street through which a large number of these vehicles pass proves very conclusively, from the stench left behind, the great amount of incomplete combustion taking place at times in the petrol engines. With vehicles using coal-gas this objectionable feature would be greatly reduced, as it is much easier to adjust mixtures of coal-gas and air to suit the varying load conditions. To meet the requirements of these motor vehicles it would be necessary to provide gas-filling stations at reasonable intervals, where the driver could get his receivers charged with gas. With a fleet of lorries working over a definite route, small stations could very easily be fitted up, and would certainly pay the motor proprietors handsomely. It would thus appear that coal-gas is peculiarly suitable for such a service as house refuse collection, for which petrol was not considered to account of the frequent stoppages.

The Repair of Footpaths.

It is, of course, an elementary principle of highway law that a public footpath, whether it runs alongside a road or through private grounds, is a highway, and that the liability for its repair and maintenance is governed by the rules applicable to highways in general. It is true that, under sec. 13 (2) of the Local Government Act, 1894, parish councils have the power to undertake the repair and maintenance of all or any of the public footpaths within their parish, not being footpaths at the side of a public road; but it is expressly provided that this power shall not, nor shall the exercise thereof, relieve any other authority or person from any liability with respect to such repair and maintenance. It will be seen therefore, in the first place, that there is no obligation on the part of a parish council to undertake the repair of footpaths; secondly, that they have the option of doing so in the case of all public footpaths, except those at the side of a public road; and, thirdly, that the exercise of this option will not shift the responsibility for such repair. This proviso is certainly rather curious, but it is perfectly clear and explicit. Nevertheless, we have reason to believe that misconceptions exist in some quarters as to its precise effect, more especially with regard to footpaths separated from the road by a strip of greensward of considerable width. It has been suggested that footpaths of this class are *not* "footpaths at the side of a public road" within the meaning of the section, and that therefore they are repairable by the parish council. We are not aware of any authority or ruling as to the meaning of the phrase "at the side of a public road," but we should be inclined to agree that such footpaths as above referred to are not within its scope. It will be seen, however, from what has been already stated, that there is absolutely no ground for the suggestion that footpaths of this class are necessarily, and *ipso facto*, repairable by the parish council. As we have seen, assuming that that council have power to undertake such repair, it is entirely optional with them to do so; and even if they exercise that option the existing liability for the maintenance of the paths (which presumably in most cases will rest upon the district council) will continue as before. Before proceeding to exercise their option a parish council will, of course, have to consider very carefully the provisions of sec. 11 of the Act, which, it will be remembered, impose certain restrictions on their expenditure, and comprise directions as to the manner in which their expenses are to be met.

* * *

The Investigation of Atmospheric Pollution.

The Committee for the Investigation of Atmospheric Pollution has been renamed the Advisory Committee on Atmospheric Pollution to the Meteorological Office, and as the change has been accompanied by a small grant of public money we may be allowed to express the hope that there is a sphere of useful public service in store for the body under its new title. The committee was formed for a purpose the nature of which may be easily obscured, if not altogether overlooked, amid the preoccupations of a war, and it is therefore all the more commendable to find that there is a disposition even in these times to establish it on a permanent basis. There are obvious advantages to the community at large in the possession of a continuous record, from year to year, of the state of the atmosphere as regards suspended impurity. Fuel economy, smoke prevention, public health, agriculture, and the preservation of buildings are problems more or less involved in the investigation of atmospheric conditions, and it is only by methodical observation that desired results can be obtained. But

observation, though it take extensive view, would be of merely limited usefulness unless records are kept, and these are also available in a collected form for the information of those concerned with the inquiries. In furtherance of the aims of the committee a modest grant of £500 has been allotted by the Department of Scientific and Industrial Research, to cover the cost of the work for the current year. The grant is intended to defray the expenditure of the Advisory Committee only, and is given on the understanding that the cost of the gauges, collection, and analyses shall be borne by the authorities which co-operate by setting up observation stations. The committee are naturally anxious that the value and continuity of the work should not be endangered by stations suspending observations, if it is at all possible to avoid it, and also that authorities in parts of the country not at present represented will consider the advisability of installing gauges. Conviction with respect to these installations is not by any means universal, but what surveyors and medical officers of health have not yet achieved in this respect might perchance be expedited by an appeal to the hon. secretary of the committee, Dr. J. S. Owens, 47 Victoria-street, Westminster, from whom all information as to the method of working may be obtained.

* * *

Death of Mr. Harpur.

By the death of Mr. William Harpur, the city engineer of Cardiff, the Institution of Municipal and County Engineers loses a second of its past-presidents within the short space of ten days. Mr. Harpur's kindly, genial nature endeared him to a host of friends, and his death will be keenly regretted not only by the corporation to which he gave such long and honourable service, but by all with whom he came into contact in the sphere of his wider activities. Few cities can boast of the same development as Cardiff, both as regards mere size and municipal efficiency. During the last hundred years the population has increased from 2,577 to well over 180,000, and for the last forty years of this period Mr. Harpur has occupied the important position of city engineer and surveyor. Some indication of the magnitude of his labours may be gathered from the fact that during this time the population has increased by about 100,000. It was therefore with legitimate pride that Mr. Harpur was able to state last year, in the course of his address as president of the Institute of Cleansing Superintendents, that the whole city is efficiently sewered, and provided with an excellent water supply, and 135 miles of wide and well-kept highways. Further, the civic centre of Cardiff, in which are situated a number of imposing public buildings, forms a permanent memorial of his foresight in regard to the principles of town planning as applied to a great centre of population. Indeed, the development of Cardiff is the result of that happy co-operation between a corporation and its officials which is so much to be desired in the public interest. The whole municipal engineering profession will sympathise with the city of Cardiff in the loss of an eminent public servant.

* * *

Road Service in France.

Although it is beyond doubt that much good work has been accomplished by those responsible for the organisation of our road services in France, more than one complaint has reached us as to the waste of man-power due to the utilisation of highly skilled men for work for which they have no special aptitude. An example is afforded by a report which was presented by the surveyor at the last meeting of the Settle Rural District Council. It appears that some time ago one of the council's steam roller drivers volunteered for road service in France on the understanding that he was to be employed and paid as a roller driver at a minimum rate of half-a-crown a day. It now transpires, however, that he is working as a navvy at 1s. 8d. a day, although he has never before done any labouring work. The surveyor, upon hearing this, communicated with the Director of Railways and Roads enquiring why the terms of the man's enlistment had been departed from, and submitting that if he could not be employed by the military authorities as a steam roller driver he would be of more service to the country if he were discharged so as to enable him to pursue his former employment at Settle. Alternatively, we would suggest that an engine driver would, in present circumstances, be better employed in the national interest in agricultural work in which he could use his skill than as an inefficient navvy. The organisation of the man-power of the nation is certainly becoming more efficient, but there is still room for much improvement, and every round peg transferred from a square hole to a round one brings the desired end nearer.

* * *

New Inventions.

The scheme which was suggested in a letter from Mr. Reginald Brown in our last issue for the establishment of a permanent Board of Inventions is one which will doubtless receive very sympathetic consideration by municipal engineers. The intention is that the proposed board, if established, should consist of a number of men of acknowledged experience and authority, whose opinion on the value of any invention would be at the disposal of the inventor, and whose advice would also be available for any particular industry seeking a means of overcoming any difficulty in or making any improvement on existing processes. The present system by which any idea can be made the subject of a patent so long as certain legal formalities are complied with is certainly capable of amendment and reform. Mr. Brown, with characteristic energy, has already convened an informal meeting of representatives of civil, mechanical, electrical, gas and municipal engineering, and of chemistry and public health, and the views then expressed have been laid before a number of professional societies, who have been asked to appoint delegates to a future meeting. It would, of course, be premature for us at present to express a definite opinion as to whether Mr. Brown has hit upon the best remedy for what, in our opinion, is a real fault in our national organisation. All that he asks at the moment, however, is that his suggestion may be ventilated by free discussion, and to this end we gladly open our columns to correspondence on the subject, particularly as it affects municipal engineers both as inventors and users of protected devices and processes.

* * *

Accidents from Falling Trees.

In our remarks upon this subject in our last week's issue we inadvertently referred to the case of *Hudson and Another* v. *Bray* as resulting in the liability of the defendant. It is true that the county court judge held that the defendant was liable, but his decision was overruled by the King's Bench Division; so that, unless it should be restored by the Court of Appeal, it cannot be regarded as a precedent. On the contrary, as matters now stand, it must, apparently, be taken that failure to light or guard a fallen tree does not constitute negligence in the eye of the law at present. This, however, is not material to the question we were more immediately considering—viz., the liability for damage occasioned by falling, rather than fallen, trees.

Air Diffusion in the Activated Sludge Process.*

By WALDO S. COULTER.

Unquestionably the methods at present used in the activated-sludge process for applying air to sewage are extremely wasteful. In the brief time during which the air passes from the bottom of the tank to the surface of the liquid but a small percentage of its oxygen is utilised. Comparing the volume of air now required with Rideal's statement that only ¼ gallon of air would be necessary for the nitrification of the nitrogenous matter contained in 1 gallon of English sewage, assuming the atmospheric oxygen to be fully utilised, we get some idea of the low efficiency of current methods.

If some means could be devised for successfully prolonging the period of contact of air and sewage, it is conceivable that, besides lessening the volume of air applied in the usual manner, it might bring new methods within the scope of practicability. It is, for instance, a matter of common knowledge that water falling into a pool will entrain air bubbles; and if the fall and volume be sufficiently great, the air bubbles will be numerous and driven down to considerable depths. The amount of air so entrained is not equivalent to the present requirements of the activated-sludge process unless the height of fall be made unreasonably great. If, however, the time of contact were sufficiently prolonged, this method of introducing air might prove feasible.

Having in mind the development of some simple method for securing this prolongation of contact, Mr. A. E. Hansen and the writer have conducted a series of tests both on a working scale and with glass models, during the past six months. While our efforts have not been attended with the success we had hoped for, some interesting points were brought out and a brief description of our work may not be amiss.

The working-scale experiments were made at the sewage-testing station of the borough of Richmond, New York City, at West New Brighton, and those with glass models at the office of Hansen & Coulter, New York City. The sewage-testing station was used by the courtesy of Henry P. Morrison, Borough Commissioner of Public Works.

After some preliminary work at the testing station it was decided that prolongation tests could be made more rapidly and with better opportunities for observation on a small scale with glass models. Subsequent work at the testing station was confined to tests to determine the best method of directing a jet into the sewage for the purpose of entraining air. These latter tests showed that a given discharge of sewage dropping freely from a height of 3 ft. or 4 ft. into a vertical pipe extending 7 ft. or 8 ft. below the surface forced air readily from the submerged end of the pipe, the quantity of air remaining about the same after diminishing the submergence to 5 ft. or 6 ft. Various methods of introducing the sewage at the top of the drive pipe were tried, including a form of injector and a vortex chamber, but the most effective method found consisted in simply directing the jet vertically downward into the open pipe. The drive-pipe arrangement failed, however, to entrain as large a volume of air as did the same flow of sewage discharged directly on to the surface of the sewage in the tank. As observed later in the glass models, the penetration of the bubbles was somewhat less without the drive pipe. The volume of air entrained by the fall through 3 ft. or 4 ft. was obviously insufficient, even though the period of contact were greatly increased. Owing to the absence of facilities for varying the height of the drop within the desired limits, work was discontinued at the sewage-testing station.

PROLONGING AIR-CONTACT PERIOD.

Working with glass models, efforts to discover some method of prolonging the period of contact were directed along two lines—(a) Increasing the length of travel of the air bubbles through the sewage, and (b) breaking the air bubbles into extremely small globules, so that they would be driven back by currents and diffused throughout the sewage, from which they would be but slowly dissipated.

Efforts towards securing prolongation in aerating tanks into which air was forced in the usual manner were confined to attempts to break up the air into what might be termed an "air mist," similar to aerated water drawn from a tap. It was assumed that, if a certain amount of water was delivered into the compressed-air supply pipe and the air and water together broken up by violent collision such as occurs in the chamber of a spraying nozzle, some such effect might be secured while producing sufficient agitation to keep the sludge in suspension. Arrangements were made for the discharge of the air and water under considerable excess pressure at the bottom of the tank through "Spraco" nozzles, kindly lent for the purpose by B. C. Donham & Co., New York City. This nozzle is provided with a small central passage surrounded by spirally arranged tubes, all leading to a "collision chamber" in the upper portion of the nozzle, and breaks water into a very fine spray.

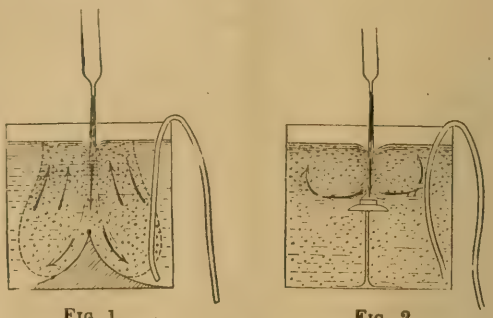


Fig. 1. Fig. 2.

Two Methods of Air Diffusion in Sewage.

The subdivision of air obtained in this manner, while very complete and comparing favourably with that resulting from the use of filtros plates, did not give the air-mist effect for which we were looking.

As regards the introduction of air by means of a jet of sewage, it was found that a jet having a velocity of about 25 ft. per second, equivalent to a drop of 10 ft., delivered into a drive pipe, entrained approximately an equal volume of air. Discharged upon the unobstructed surface of the water in the vessel, the amount of air entrained appeared to be much greater, but no means was found to measure the volume of air that would not interfere with the action of the jet.

JET IMPINGING ON SUBMERGED CONE.

The best means found for increasing the length of travel of the air bubbles was that shown in Fig. 1. The bubbles driven downward were deflected by the peak below and diverted well toward the sides of the vessel before rising. The bubbles driven farthest from the centre did not rise directly upward, but came back somewhat toward the centre, as indicated by the dotted line. A smooth, flat metal surface, if not too large in diameter, placed at a point below the water surface where the jet still retained sufficient velocity to deliver a strong blow, served to break the bubbles and throw them out toward the sides of the vessel, as shown by Fig. 2. This device also produced many very minute air bubbles that would remain suspended for some time below the field of agitation. It was not possible to secure appreciable action, however, if the metal surface were placed well down in the jar.

Efforts to break up the air bubbles and make them so small that the liquid would be freed from the air slowly have not been so far successful. Some results in this direction were secured from the arrangement shown in Fig. 2, but nothing that could be applied in practice was developed.

It is possible that the increased length of travel afforded by the downward and upward path of the bubbles, with considerable lateral motion (Fig. 1), may be sufficient to afford the requisite prolongation of contact, but this can be determined only by actual operation. It should be borne in mind that what was sought in these jet experiments was not altogether means for producing complete activation with a high degree of nitrification, but an inexpensive method of securing sufficient activation to produce at least a very complete clarification.

Experience to date has demonstrated that an equivalent degree of clarification can be secured with much

* From *Engineering News-Record*.

less air and with a shorter detention period than is required for the complete process.

In view of the simplicity of the jet method, we believe that the idea is worth trying out on a working scale as an incidental feature of a testing station.

SURFACE TARRING IN HAMPSHIRE.

By W. J. Taylor, M.Inst.C.E., County Surveyor.

It is satisfactory again to be able to report that the extensive surface tarring now carried out annually in Hampshire is attended with excellent results. The weather during the past season was favourable for carrying out the work, and it was completed notwithstanding the labour difficulties. About forty women assisted with the work. Nearly three hundred miles of roads were tarred during the season of 1916. These surfaces have offered much greater resistance to the wear and tear of traffic, and it would be difficult to overestimate the great advantage which has been secured by carrying out this work upon the roads, as it has gone a long way to minimise the break up of the road surfaces at a time when it was impossible to renew worn-out coatings except over a very short mileage.

The usual precautions have been taken with regard to treatment of roads near streams and no complaint of any injury to fish has been received.

Further tenders were invited during the year for the supply of tar, and before these tenders were invited, Mr. W. J. Atkinson Butterfield, M.A., F.I.C., Assoc.Inst.C.E., was again consulted as to the specification laying down the constituents of the refined tar now used upon the roads. Mr. Butterfield was informed that the tar had given excellent results in so far as improved maintenance of the roads was concerned, and that it was not used adjoining streams where the washings from the road surface could flow directly into them.

Mr. Butterfield stated: "I have carefully gone through your Specification for Tar, and see no reason for making any substantial alteration in it, especially in view of the information which you give me in your letter. In the 'Phenols' clause, however, I think '2 per cent' may now be substituted with advantage for '3 per cent,' as it will give rather greater security from risk of injury to fishing waters, and will not at the present time add anything to the cost of the tar.

"In regard to surface tarring near streams, I am convinced that risk of injury to fish from the tar, with the precautions your council observes, is non-existent, except, perhaps (1) for one or two days after application—*i.e.*, before the coating has set and adhered to the road material; and (2) when a tarred surface has worn through and disintegrated, or has broken up through failure of the sub-crust.

"I think it is very important that as soon as a tarred surface shows signs of serious wear it should be refreshed by another coating of tar, not merely from the standpoint of maintenance of the road, but in order to avoid pollution of rain washings. Similarly prudence dictates that in renewal of the road crust old tarred material which is removed should not be left where rain washings from it will run into fishing waters. I think you know that all my observations in the last one or two years have led me to the conclusion that dried-off or spent tar is far more likely to injure fish life than fresh tar (if the latter is such as you specify), and no specification can altogether exclude some risk from dried-off tar, though even that risk is not, I think, very serious when the tar originally complied with your specification. I think you may be glad to have this expression of the views to which I have been led, partly as a consequence of some comparatively recent experience."

Mr. Butterfield subsequently wrote: "The breaking and churning up of a tarred coating, which has dried off and lost its viscous character through exposure to the sun, air, and traffic-friction, undoubtedly makes the phenols remaining in it much more accessible to water, so that, though their proportion is less than in the fresh tar, they pollute water to a greater degree. But at the same time the broken and churned-up surface yields to water impurities not originally present in tar, and doubtless derived from traffic. These impurities are not absorbed until the tar coating is broken up, being washed off it so long as it is sound. When absorbed, however, they pollute water to about the same degree as the phenols in the dried-off tar, so that the broken-up old tarred surface has about twice the polluting effect which it should have merely in virtue of its tar (phenol) content. I am not certain that an ordinary untarred road surface (of equal traffic), when broken up by drought and traffic, pollutes water to quite the same degree as the broken-up tarred surface does from absorbed impurities alone (*i.e.*, eliminating the effect of the phenols), and it is possible that the detritus of dried-off tar retains some of these impurities better than the dust of any untarred road. However this may be, I think there is little doubt that a broken-up dried tarred road surface has about double the polluting effect of a similar surface which has not been tarred, owing to the action of the phenols being added to that of the absorbed impurities. Either the absorbed impurities or the phenols alone may produce washings which the fish can withstand, whereas the two together may be too much for them.

"This suggests that the degree of dilution which just suffices to render untarred road washings harmless should be doubled to render the broken-up tarred road washings equally harmless—*i.e.*, the latter are risky unless there is ample dilution with fresh river, spring, or rain-water. On the other hand, I think there is no question that an unbroken tarred road surface will pollute water to a less degree than a broken surface, whether tarred or not, because it will not absorb impurities. On this account a tar-macadam crust would be safer than a mere surface tarring, though if the latter is on a really firm and sound water-bound crust and foundation and is refreshed by a new coating of tar as soon as it begins to disintegrate I think there would not be much to choose between them."

The county medical officer is engaged upon investigations to determine the form in which the phenols are washed off the road surfaces and the extent to which they can be intercepted and held up on a filter.

In his estimate for the current year Mr. Taylor puts the cost of surface tarring at 1¾d. per square yard.

BLACKPOOL IMPROVEMENT BILL.

BORROWING POWERS FOR THE PROPOSED WORKS.

The Blackpool Corporation Improvement Bill has been ordered for third reading by the House of Commons, and is now before the Lords Committee. The objects of the bill are set forth in the following clauses dealing with the borrowing powers and the periods allowed for repayment of loans:—

£186,843.—Purchase of lands for and construction of the proposed new promenade at South Shore, the road there upon which a tramway is authorised to be constructed, the proposed new promenade north of the existing northern boundary of the town extending to Arundel-avenue, and a public walk or promenade between the tramway and foreshore extending to the Norbreck Hydro. Sixty years from date of borrowing.

£26,657.—Purchase of lands for and construction of the proposed extension of Church-street, South Shore, to the southerly boundary of the borough, widening and improvement of Watson-road and extension to join up with the new promenade, extension of Burlington-road to the new promenade, and widening of Harrow Side-lane and extension to join up with the new promenade. Fifty years from the date of borrowing.

£32,000.—Purchase of lands for and construction of sea-water swimming baths on the foreshore at South Shore and North Shore. Forty years from date of borrowing.

£35,382.—Construction of tramways authorised by the Act. Thirty years.

£6,954.—Electrical equipment of the new tramways. Twenty years.

For the payment of the costs of the Act the time allowed is five years from its being passed.

Waterproofed Cement in Reservoir Work.—The 100,000-gallon reservoir at Severalls Asylum, built some time ago, has been under constant observation by the engineer, owing to the fact that this was the first contract upon which he had specified waterproofed cement. The powder Pudlo was the medium utilised, and we are notified that the engineer has written to say the results are perfectly satisfactory.

Road Work in the Mexican Desert.

By Captain JAMES A. O'CONNOR, Corps of Engineers, United States Army.

[In this article, which forms part of a contribution to the Professional Memoirs of the Corps of Engineers (May-June issue), the author describes the operations connected with the opening up and maintenance of roads for the supply of the punitive expedition into Mexico which followed Villa's raid on Columbus, New Mexico, in March of last year. The matter furnishes a striking example of experience in road building and in the handling of road machinery and labour gained under most adverse conditions.]

The maintaining of the expedition in Mexico depended largely on the regular furnishing of supplies which could be obtained from the country had been used up in the first movement. The section of Mexico that was occupied is not fertile, and the distances to be dealt with have resulted in nothing being raised that which the few inhabitants on the district required for existence. It was of the greatest importance to establish at all stations a reserve for any ordinary emergency, such as would result from an attack or from an interruption of communications by any other means. To carry the forty tons daily which was transported by trucks required an average of the train of thirty-three trucks. While an average of sixty-six trucks per day passing over the road does not appear to be a large number, the destructive effects of this number of trucks run in trains are very great. In the first place, expert drivers were found to obtain not only those who cared to know it would stay. The drivers were on the road up to twelve days at a time, sleeping out at night and in the daytime running in dust so thick that soon after they started on a trip no one could recognise them by their features or colour. In addition, they were working early and late in getting out trucks that were stuck and in repairing others, so that they could keep running. This was work for youths and adventurous spirits, who were in the large majority, and the very qualities that fitted them for the work acted to the truck and road problems.

In view of the necessity of accumulating reserve supplies, the speed of the trains was about the maximum they could maintain. The head of the column rarely averaged more than fifteen miles per hour, but the opening out and closing up of the trucks resulted, to all intents and purposes, in running the trucks as fast as the material would stand and the road permitted, so that the better the road the higher the speed and the limit of destruction to the road was that which the trucks could stand.

The problem presented was to provide a road for this traffic. The section of Mexico that was occupied is of its entire general character as southern New Mexico. It is practically a desert plateau 4,000 ft. above sea level at Columbus, about 5,000 ft. at Dublan, and about 6,000 ft. at Namiquipa, with a number of outcroppings and small ranges up to 3,000 ft. above ground level. The valleys are plains of alkali, sand, gravel, clay, adobe, or caliche (a sand and gravel mixture), with their various mixtures. These soils vary from a fine, friable, alkali dust to a fairly compact sand, gravel, and adobe mixture. In sections where the road could be located on a soil of the latter character, the results were satisfactory—these sections, however, were very limited. Using caliche as a top dressing, good roads can be made during the wet season, but in the dry season the caliche is readily ground up and soon destroyed by traffic. The general impression in passing over the country is that of alternating stretches of alkali and adobe plains. At the higher points many ridges of rock are encountered. One of these ridges is called "Jumping Jack Hills" by the truck drivers, because the passage of the trucks over the road around the rocks into a fine powder which soon blows away, leaving a road which resembles a road over a bed. Although the winters are comparatively mild there are rains from October to March and sometimes as late as ending Feb. The summers are very hot, but the air is dry and the nights cool.

INITIAL WORK.

The [illegible] was the interesting one. Without [illegible] the roads were [illegible] and with [illegible] were almost universally [illegible] the traffic would cause. In general, the problem [illegible] in providing some [illegible] for a traffic the worst portion of which required a hard-and-fast condition [illegible] good the roads were different to [illegible]. Up to June 1st the work done was passed [illegible] that the roads were kept passable by filling chuck holes, removing rocks, fixing arroyo crossings, and opening up new stretches as the roads became impassable and surfacing short, sandy sections. This pioneer work presented a number of problems. The chuck holes, for instance, were first cleaned out and filled with gravel, but the gravel was soon squashed out, or pushed out if it was loose, and, if it was made solid, chuck holes were readily formed on each end, making a worse obstruction than before. Satisfactory results were obtained in places by making the sides of the chuck holes vertical and filling with compacted broken rock or stone, but this material was rarely available. The rocky sections were simple problems for a suitable base and good material was available. Attempts were made to surface the sandy stretches with caliche and adobe mixtures and with gravel but without water, which was not available; this proved of little value. An experiment was made in building a plank track of 2-in. by 12-in. planks over a particularly bad, sandy stretch, but these were soon broken up. Where the roads crossed adobe or gravel they lasted very well for several weeks, and when the ruts became too deep a new road was opened alongside the old one. Filling the holes without an available supply of water was found to be useless, as the disturbed ground was readily ground into dust, which obscured such holes as might otherwise have been seen through the dust caused by the passing trains. Patching any road required careful work and selected materials, neither of which could be obtained.

In general, except for the very favourable stretches above referred to, little could be done to repair the dirt roads, which by June had a covering from 1 ft. to 2 ft. deep of dust, of about the consistency of flour. The main solution was to open up new roads as soon as the old ones became worn and to keep the arroyo crossings in repair. The arroyos were dry, but crossing places were generally scarce. Where practicable, and where timber could be obtained or furnished, bridges were built; in other places the crossings were paved. Before the beginning of the semi-permanent road these crossings were made by cutting the banks to a convenient slope and building two tracks, 2 ft. wide, of flat, two-man stones set on edge with their long dimensions crosswise, and tightly wedged. This pavement was sometimes covered with adobe or gravel. Considerable care was required in making these pavements, for with any looseness the stones were gradually pushed out of the way by the trucks and the effects of the pavement destroyed.

BRIDGES.

Two trestle bridges were built: one 180 ft. long over the Casas Grandes River, and the other, 150 ft. long, with a 1,050-ft. stone causeway, over the Santa Maria River. The Casas Grandes River was dry until the rainy season, when at times it had over 10 ft. of water. The Santa Maria River was a flowing stream during the expedition, and previous to the construction of the bridge it was fordable, but a small rain made the ford impassable. The crossing at the bridge site was 1,200 ft. wide, and the general design of the bridge was determined by the amount of lumber that could be obtained. This was one carload, which had been hauled 65 miles by native wagons and which permitted the construction of 150 ft. of bridge over the main channel. The remainder of the crossing was a rock causeway with one 12-ft. culvert. The undue contraction of the channel was considered at the time, but the bridge was expected to last until the height of the rainy season, when conditions, as had been foreseen, were not pressing. It being impracticable to drive piles into the hard-pan of the river bed, small cofferdams, made of the bridge decking and adobe, were built. The trestle piles were sunk into the hard-pan and as large rocks as could be handled were piled around the bases of the trestles. The bridge was the ordinary type, with trestles 10 ft. on centres with a rock filled crib at the causeway end, and was erected by thirty soldiers in twenty-six hours. The causeway was built in two and a half weeks by 500 natives and

150 native wagons (five and six mule). This bridge was washed out in August and again in September. The last time the span was increased 50 ft., which has so far proved sufficient to pass the high water.

A WET-WEATHER ROAD.

It became evident by June 1st that the expedition would be in Mexico during the rainy season, and steps were immediately taken to provide for it. A proposition to build a plank road across the desert to Guzman and to use the railroad from there on was considered, as was also the construction of a plank road over the worst places in the existing dirt road from Columbus to Colonia Dublan. The plan to build a graded road as a wet-weather road and to continue

UNITED STATES ARMY TRUCKS ON WAY TO MEXICO.

the use of the pioneered roads in the dry season was finally adopted. The preparations for the new road included the purchase of machinery and the providing of about sixty Jeffery trucks. The road machinery purchased may be divided into five classes: Tractors, graders, rollers, scrapers, and drags. Eleven tractors were purchased: six 75-h.p. Holt caterpillars, where little weight is carried by the front wheel; two centipede tractors of the same general principle as the caterpillar, but where a considerable portion of the weight is carried by the front wheels; and three rear-wheel-drive tractors. Two rear-wheel-drive tractors were later hired. Six 12-ft. graders, eight 6-ft. graders, six elevating graders, three steam rollers, three tractor-drawn rollers, 100 slip scrapers, and a few drags were purchased, and a number of drags were made. In the purchase of this machinery there was no time for making previous tests to determine the most suitable kinds, and where a preference was indicated prospective delays in time of delivery resulted in the purchase of a machine that could be more quickly obtained. Provision was made for the hiring of as many Mexican labourers and teams as could be effectively used, the maximum force at one time being 800 labourers and 250 teams, in addition to the troops. The graded road was to be built 26 ft. wide with ditches 1½ ft. to 2 ft. deep, with no shoulders and with the crown about 6 in. above the original ground level, and was to be ultimately top-dressed with the best available material. The object was to get a road so that the trucks could run on any section of it and several series of roads could be formed if necessary.

As a result of the experience in roads up to this time, moral support for the wet-weather road was made noticeable by its absence, and as the work progressed the resulting pile of dust destroyed most of the optimism the previous experience in roads in Mexico had left.

The road had been divided into three sectors for the pioneering work and the same divisions were retained. By September 1st the crowned road and drainage was practically completed to a point ten miles south of Dublan. All arroyo crossings had been prepared from there to El Valle and in addition a 24-mile stretch from Vuelta de Alamos to Dublan was top-dressed. Some top-dressing had been placed on the sandy stretches in all the sectors, particularly on a 4-mile stretch north of Ojo Federico and on a 10-mile stretch north of Corralitos Station. The rainy season so far had been a disappointment. There had been barely sufficient rain to make the graded road passable, but the dry-weather roads had by this time become impassable and the graded road was the only available route. Being built without any binder, the compacting process was a slow and laborious one. Each truck train that passed destroyed the road and each time it was again rebuilt with graders and drags. The rollers were given a thorough testing, but were gradually discarded as the drags began to prove their efficiency. With the continued rains, especially some heavy ones in the latter part of August and first part of September, the effect of the compacting by the trucks and the dragging became more pronounced and a comparatively smooth dirt road gradually developed. In this condition the procedure after each rain was to drag the road as soon as it had dried sufficiently, and to drain any ruts or low spots when water had collected. Occasionally, when a truck train had passed too soon after the rain, it was necessary to regrade it.

During the remainder of the rainy season to about September 21st the road problem was a simple one, and it began to be considered that the wet-weather road might be maintained through the winter months with the occasional rains that were expected. The last week in September and the first week in October with dry, hot, windy days, however, were sufficient to reduce the crowned road to its impassable condition previous to the rainy season and the dry-weather pioneered roads were again used. The rainy season had apparently passed and the graded road was again being prepared when, on October 12th, there began a soaking three days' rain. Both the dry-weather roads and the wet-weather road were impassable to truck trains. By the 16th the graded road had been put in condition so that the trucks could travel it, and

VIEW OF ROAD IN EARLY DAYS OF EXPEDITION

shortly after a satisfactory dirt road had again been prepared. To save the road, in order to avoid any future delay due to rain, the trains were shifted to the dry-weather roads as soon as they dried out.

A SUNKEN ROAD.

Up to this time a new system of maintenance on a pioneered road had been gradually developed. It consisted essentially in grading out the ruts with a tractor and a large grader, rather than attempting to fill them. This results in a sunken road and permits the use of hard-used virgin ground without a continued excavating and clearing out of new roads. These sunken roads with no drainage naturally are not suitable for wet weather, but with the graded road, specially provided for this condition, the problem of

making possible as much as is under the conditions present is easy to understand. The sunken, or "shaved" road, as it was called, is a decided departure from the usual road-making principles. It was expected at first that new roads would have to be frequently opened, but from October, when they were first started, to the withdrawal of the expedition in February, 1917, one road was sufficient. In places it was scraped to a depth of from 1½ ft. to 2 ft., but the average depth was about 1ft., with an average width of 16 ft. The amount of material that had to be scraped off in order to keep the road in good condition was surprisingly small. During the winter the moisture is retained by the ground for much longer periods

An Example of the Difficulties Encountered.

of time than in the hot, dry, summer months, and it is probable that it would require considerably more scraping, with a consequent necessity for more frequently opening up new roads in summer, over what it required in this case.

One feature that was of considerable assistance in preserving the road was the control of the traffic. Up to October the speed of the trains was not controlled nor the roads to be used prescribed. In October, however, the maximum speed was limited to 12 miles per hour and the Chief Engineer Officer was given authority to prescribe the roads to be used and even to stop traffic for short periods of time after heavy rains.

In the actual construction of the graded road there were few points of interest, once the working force was organised. Particular care had to be taken with the drainage, especially at the water crossings. A large number of corrugated, galvanised iron culverts in sections were used. These were easily transported and readily placed. Some wooden culverts were built, and a number of paved crossings were constructed. These pavements on the graded road were 12 ft. wide and were made of two rows of [illegible] laid on a prepared bed and with the interstices packed with spalls. Only the most careful work held up under the heavy traffic. The paved crossings were not favoured by the drivers and travellers on the trains, but they served a purpose not foreseen by reducing the speed of trucks and in requiring more careful driving. Considering the damage to an earth road by heavy truck traffic, this is an important feature. The paved slopes should not exceed very much a 6 per cent grade nor be too narrow, as the [illegible] In the deeper crossings a [illegible] makes the crossing impracticable, but [illegible] at this time [illegible] destroys the road the [illegible] does [illegible] at a disadvantage.

Road Machinery.

The experience with the road machinery was rather diverse. Of the six types of tractors tested four were of the four-wheel drive type which were easily stuck in sand, mud, or soft-going and were finally discarded. The other two types were the caterpillars heretofore described and the 75-h.p. Holt caterpillars. The remaining two were of the so-called British "tanks," were a decided success. The 12-ton machines have a bearing pressure on soft ground of 7 lb. per square inch and can negotiate most any kind of country with a load. In addition to their regular road work, they were continually used to drag out the trucks and other tractors that had been stuck. Considerable difficulty was, however, first experienced with break-downs and repairs, until an expert from the factory was provided after which they were kept in almost continual operation. The centipede type was constructed of poor materials and was probably the least useful of those tried out. A large number of trucks were required for the small scrapers, drags, water wagons, dump wagons, transportation of supplies, &c. The Jeffery, 4-wheel drive, brake and steer with the interlocking differentials, proved the best for the work required of them. Except in the deepest sand and in mud, in which they sank to their axles, they could be relied on to keep going. Two trucks were sufficient to haul a small grader with a 6-ft. blade, and one handled an 8-ft. drag with ease. This, together with their use in pulling the supply trucks out of difficulties, was the hardest kind of work for them, and was probably to a large extent responsible for the continual repairs required. There seems to be little question, however, but that the mechanical difficulties could be decreased considerably by an improvement in material and probably in design.

The steam rollers, as stated before, were of little advantage, and were discarded. The type of roller used had too high a centre of gravity and was easily tipped over. The cost of transporting coal made their operation decidedly uneconomical, considering the results obtained. Under the conditions in this section, where coal is scarce, only gasolene or oil driven engines should be used. The tractor-drawn rollers had the same defect in design, with too high a centre of gravity. The large graders, with a 12-ft. blade, proved to be good road-building machines. They were ordinarily drawn by caterpillar tractors, though they were sometimes used with four Jeffery trucks.

The Sunken or "Shaved" Road.

The same graders with a 6-ft. blade were too light for road construction, but gave good service in the maintenance of the graded road. There is some doubt as to the advisability of purchasing so light a grader, for most of the maintenance work on the graded road can be done by a drag, and the heavy graders are required on the sunken pioneered roads. A number of wooden drags of the ordinary type, with a cutting edge of iron or steel on the front runner, were made and gave satisfactory service. Several drags were purchased, but they were not any better, if as good, as those made in the field. As a result of the experience on the road in Mexico, the types of road machinery that gave

successful service were the 75-h.p. Holt caterpillar tractors, Jeffery trucks, large 12-ft. blade graders and the road drag of the type shown in the U.S. Department of Agriculture Bulletin No. 597. For handling material for top surfacing and building grades, ½-yard gas or oil engine shovels or drag lines would have been of considerable service and their purchase fully justified.

It has been proved by the experience in Mexico that trucks can be used for the supply of a force in the field. However, truck trains run on dirt roads are not economical propositions. As stated in the beginning of this article, the object of the expedition, up to the time of the Parral affair, was to capture Villa, and no method of transportation available could have replaced the trucks. They served their purpose and did it well. Upon the establishment of more settled conditions the use of other kinds of transportation were considered, but no change was made because of the fact, hard to appreciate now, that at no time while the expedition was in Mexico was it believed that it would remain three months longer. This, in itself, eliminated from consideration the construction of a railroad, or even of plank or metalled roads, for a force of the size of the expedition. Dirt roads and animal transportation are an economical combination from the standpoint of the road, but in this case the great distances, the lack of water, and the necessity of hauling all forage made the use of this form of transportation impracticable. The caterpillar tractors furnish, fortunately, a solution; they require very little road construction, and the experience gained with them in the road work in Mexico showed their suitability for the transportation of supplies. Wheel tractors are not considered in the comparison for the reason, as before stated, that they were easily stuck in mud and deep sand, which conditions were frequently encountered.

Considered as a whole, the experience gained by the engineer troops was valuable. Their work in the opening up and maintenance of roads was of primary importance for the supply of the expedition, and they gained experience in road building and in the handling of road machinery and labour under most adverse conditions. As the work progressed, the value of localising responsibility became more and more apparent, and when the construction work was completed and maintenance work begun, the assigning of a small section of the road to one man with the necessary labourers and machinery had the result of giving him a proprietary interest in that section of road and a desire to make it better than any other similar section.

CARDIFF RESERVOIR CONTRACT.

JUDGMENT FOR £12,388 AGAINST THE CITY COUNCIL.

In the King's Bench Division on Friday last Mr. Justice Bray gave judgment in the special paper case of *Nott* v. *The Cardiff Corporation*. Mr. L. G. Nott, a Bristol public works contractor, obtained the contract to construct the Llwyn On Reservoir. Disputes arose between the parties, and the matter was submitted to an arbitrator, who found in favour of the contractors.

Mr. Justice Bray, giving judgment, said the disputes arose mainly owing to the objection by the contractor to do extra work, and the contractor availed himself of the right of appeal from the engineer to the arbitrator, as laid down in the arbitration clause in the contract. Referring to the contractor's claim for rates paid on the railway he occupied, his lordship said he could see nothing to justify him in holding that the arbitrator was wrong in finding that the contractor was not the occupier of the railway, and therefore not liable to pay the rates. The corporation failed on that point, and must now pay the contractor the sum he had paid. Referring to the claims for extra work done by the contractor at the request of the engineer of the corporation, his lordship said that it was clear the engineer had refused to give instructions in writing as provided by the contract. He (the judge) would uphold the arbitrator's findings in favour of the contractor, whose claims would be allowed. The question in dispute between the parties as to the mixing of the cement he should treat as extra work, and would find in favour of the contractor. The award must stand for £12,388 18s. 2d., and the contractor would have the costs.

Mr. Holman Gregory, K.C. (for the corporation) asked for leave to appeal.

The judge said he did not think the corporation should appeal, although he was bound to say there were difficult questions of law, and he would give leave.

ATMOSPHERIC POLLUTION.

A GOVERNMENT GRANT.

Owing to the importance of the work undertaken by the Committee for the Investigation of Atmospheric Pollution and the advantages likely to result from obtaining a continuous record, from year to year, of the state of the atmosphere as regards suspended impurity, the committee has been constituted an "Advisory Committee on Atmospheric Pollution" to the Meteorological Office, and a grant of £500 has been allotted by the Department of Scientific and Industrial Research to cover the cost of the work for the current year. The grant is intended to defray the expenditure of the Advisory Committee only, and was given on the understanding that the cost of gauges, collection and analyses should be borne by the authorities which co-operate by setting up observing stations. Provision has also been made for the nomination by each co-operating authority of a person for appointment as a member of the Advisory Committee.

The action of the Department of Scientific and Industrial Research in making the grant was only taken after full and careful consideration of the public advantages likely to accrue from the continuation of the work even during the war. At the same time, and since the value of the investigation depends on there being a sufficient number of observing stations, it was indicated that every effort should be made to maintain existing stations and to increase the scope of the movement. The collection, compilation and publication of exact statistics on the suspended impurities of the air has a valuable function and supplies a long-felt want in connection with the study of problems relating to fuel economy and smoke prevention, as well as agriculture, health, and the preservation of buildings. The reports for the years 1915-16 and 1916-17, forming the second and third annual reports of the committee, will shortly be published, the former, it is hoped, in about a month and the latter a little later.

The committee are naturally anxious that the value and continuity of the work should not be endangered by stations suspending observations, if it is at all possible to avoid it, and also that authorities in parts of the country not at present represented will consider the advisability of installing gauges. Full information as to method of working, with standardised instructions and blank forms for returns, can be obtained from the honorary secretary, Dr. J. S. Owens, 47 Victoria-street, London, S.W. 1.

WHAT IS "EXCESSIVE TRAFFIC"?

A RURAL COUNCIL'S PROBLEM.

At a meeting recently of the Helston (Cornwall) Rural District Council the clerk read a letter from Messrs. Freeman & Co., stating that their traction engine was registered by the county council, that it was work of national importance to convey manures to the different farms, and that they could do no other than use by-roads when delivery was in that district.

Mr. W. Hoskin spoke of the damage done to some of the roads, and could see no other result, as the subsoil was a clay one, and the stones simply sank in the soil. The only course would be to pay higher rates and keep on repairing.

Mr. R. Lawrance: Seeing that the manure is for the biggest ratepayers they must "pay up" and get the roads repaired.

Mr. P. H. Williams wished to know if this constituted excessive traffic. Mr. Freeman might say he was doing national work, but if that involved excessive traffic, surely there could be a claim made for damages?

Mr. John Rowe: If the county council have granted a licence to use this traction, what can be done? It appears as if we are powerless.

Mr. J. Harvey: Have we not put in a claim for damages done by carts which was stated to be excessive traffic?

The Clerk: Yes, we have on several occasions.

Mr. J. Harvey: Then I consider we should deal with this question.

Mr. P. H. Williams moved that the surveyor make an estimate of damage done to roads in the district by excessive traffic, and that a claim be made on the respective persons.

This was carried.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

In view of the statements made by Professor Abrams on the subject of "Excess Water in Concrete," has it not always been the trouble with regard to concrete that the workmen, if left to themselves, will add too much water for the simple reason that it is more easily handled, and "comes off the shovel" more readily when in a wet condition than when it is in the right condition of plasticity? Can the workmen be blamed when it is known that concrete mixing by hand is about the hardest work to which a man can be put?

* * * *

Is it not rather a sign of the times that *Punch* of May 16th should poke fun at municipal and county engineers—not once, but actually twice? In one paragraph it says: "Arundel proposes to have a house-to-house collector of bones. The borough engineer is understood to be completing specifications for a dog-proof trouser, which will be a part of the collector's uniform." Another paragraph is to the effect that as the county surveyor of Essex has received more power over the conscientious objectors on the roads, Mr. Outhwaite is to ask in Parliament whether the surveyor actually threatened to give one of them a slap. Don't many of us wish he would?

* * * *

As English engineers are sometimes twitted with the suggestion that they are not so sharp as American engineers, is it not rather refreshing to read that in some unnamed American city the responsible official made a miscalculation as to the position of an existing sewer, with the result that a number of foundation piles were driven right through it? Would not one have thought that when the piles were being driven they must have suddenly dropped a few feet, and thus indicated that something was wrong?

* * * *

Why is it that the Chief Commissioner of the Metropolitan Police is so much opposed to the "Safety First" proposal that pedestrians should keep to the left instead of to the right, which is so obvious an improvement on the present dangerous practice? Is it not satisfactory, however, to learn that nearly all the metropolitan borough councils have accepted the proposition to alter the present rule, and will not public opinion be too strong some day for the Chief Commissioner?

* * * *

Why is it that the question of concave *versus* convex roads crops up from time to time when the matter was dealt with at least forty years ago by Mr. Ellice-Clark, in a paper read at a meeting of the Institution of Municipal and County Engineers? Has it not been proved that such a profile would create drainage and other difficulties, and would be more dangerous to traffic, as vehicles would lean towards each other? Can we therefore treat seriously the proposals, put forward by a correspondent in The Surveyor of May 18th, that such a form of road with a tram line in the centre of the carriage way could be advantageously constructed?

* * * *

Are we to have municipal kitchens or municipal food barrows in the streets? If we are to have the latter, is it not to be hoped that the people in charge of the barrows will have a cleanlier and less disreputable appearance than some of the food vendors who appear in our streets at the present time? Is it not curious that these vendors have never thought of smartening themselves up a bit in order to attract custom?

* * * *

Is there anything new in Mr. Lamb's suggestion at a meeting of the Chemical Industry Club that the [illegible] should be employed in the making of roads? Was not an experiment on these lines attempted about fifty years ago at West Bromwich, or some town in the neighbourhood, and did it not prove a complete failure? Should we not all welcome a really practical method whereby such a waste product could be so utilised?

* * * *

Is it really necessary that we should have a Central Public Health Department added to the almost innumerable Government Departments which exist at present? Do not the Local Government Board and their excellent medical staff do all that could possibly be wished in looking after the health of the community? Was not the Law Committee of the Association of Municipal Corporations quite right and well-advised in coming to the conclusion that another department is quite unnecessary?

THE TRIBUNALS.

An application of the county surveyor of Worcestershire, Mr. C. F. Gettings, for the exemption of a single man, aged thirty-one, engaged as a steam roller driver, was opposed by the military representative at Halesowen Tribunal on Saturday, on the ground that the man would be more useful in the Army. Mr. Gettings explained that the county council allowed a driver over fifty years of age to go to France, in order that they could retain the services of the applicant, who at the time was rejected, and if the man was sent into the army they would be without a driver in the Halesowen district.—Two months' exemption, to be not renewable without leave, was granted, but the county surveyor intimated that he should appeal, as he could not afford to lose the man.

At Halesowen Tribunal on Saturday, when the rural council appealed for the exemption of the surveyor, Mr. G. H. Spires, and the sanitary inspector, Mr. A. E. Shaw, the military representative alluded to the fact that some years ago the whole of this work was performed by one man, and inquired if it was not possible for such an arrangement to be made so that one of the two men could be released for military service. It was stated that the surveyor was responsible for the control of twenty-six miles of roads and sixteen miles of sewers, whilst he was engaged in the preparation of a housing scheme and other improvements. The sanitary inspector's duties had also increased.—Three months' exemption was granted to the surveyor and two months in the case of the sanitary inspector.

The Barnstaple Borough Tribunal last week considered a military application against the exemption of Albert Ford, thirty-eight, married, acting assistant surveyor under the Devon County Council.—Mr. R. M. Stone, divisional surveyor, said Ford was the only man he had left with any previous county council experience. He (Mr. Stone) was frequently away, and had to leave a great deal of work to him. Ford was particularly useful just now because of his expert knowledge of quarrying and machinery for the same. The Government had taken over the quarry outputs recently, and they did not know what to do to get stone with which to keep the roads going. Ford had supervision over about £2,000 worth of machinery, and also helped in the office in his spare time, five of his (Mr. Stone's) staff having enlisted. It was suggested that Ford would be useful for road construction work in France, but Mr. Stone replied that they did not want the foreman type as much as the navvy, and he thought Ford would be more usefully employed at his present work.—June 15th final.

At the Wilts County Appeal Tribunal the surveyor to the Malmesbury Rural District Council (Mr. W. H. Lintern) made an application for an extension of the certificate of one of his two steam-roller drivers. The man is passed for general service, and various periods of exemption have been given since September last the last of which expired on March 14th, since when the case had been adjourned, with a view to substitution. Mr. Lintern said he was sorry he had been unable to get anyone to take the man's place, though he had advertised in three newspapers.—Captain Morley: Have you had any answer?—The surveyor: I had an answer from a man who could not drive a roller at all. Captain Morley: How long have you had to obtain another man? The surveyor: Eighteen months. I have trained another man and he has gone. That was the assistant. In further reply to Captain Morley, Mr. Lintern said they had three rollers, only two of which could be worked. The only two men of military age he had left out of twenty were these drivers. Eighteen of the men had gone, which he submitted was a very fair percentage.—The chairman announced that they proposed to give the man until July 30th. He suggested the possibility of getting a driver from the Army, and the court was not without hope that the surveyor would yet be able to find a substitute. They thought, however, that Mr. Lintern had done what he could.

ROAD DAMAGE.

EFFECT OF MILITARY TRAFFIC IN HAMPSHIRE.

In his report for the year ended March 31st last Mr. W. J. Taylor, M.INST.C.E., the county surveyor, observes that in consequence of the prevailing conditions making it impossible to obtain and apply the material required, many of the main road coatings in Hampshire have worn out, extensive lengths have been holed and corrugated, while some have been cut through into the subsoil. There has, in consequence, been a continuance of the deterioration of the road surfaces generally to which he has previously called attention. Against this, however, there is the good condition of a limited mileage of main roads which have been restored under military requisition, and on which there has been no recurrence of extraordinary traffic. The situation has also been very much helped by work carried out before the war under a loan improvement scheme, and although it has not been possible to complete the reconstruction of all roads included in the scheme, by which it was proposed to convert about 49 miles of the weakest portions of important trunk roads into strong heavily coated sections—fortunately, about 41 miles were remade before the war. This very appreciably facilitated the task of maintaining some of the heavily trafficked lengths of main roads under the conditions of labour and material which have subsequently prevailed; particularly has this been experienced on some of the routes used by military traffic. With one or two exceptions these reconstructed roads are in good order.

Two or three lengths destroyed by war traffic have either been reconstructed under military requisition, or estimates of the extra cost claimed in respect of damage done by extraordinary traffic upon them have been approved by the War Department on the advice of the Road Board.

The tarmacadam coatings laid down under this scheme on the road between Fareham and Emsworth, and from Southampton towards Bournemouth as far as Lyndhurst, have very satisfactorily carried the traffic placed upon them, and notwithstanding the unusual extent to which some portions have been used, there is every indication that they will last in good condition for at least the period anticipated when they were laid down.

Whilst there has been no widespread damage to the main roads caused by the extraordinary traffic in connection with the construction of camps, such as that experienced in the previous two years, there have been many specific cases of such injury. Four pieces of main roads leading to one district, over which material for the erection of munition works was hauled, were in places very badly damaged, and the thin coating in some parts collapsed under the unusually heavy traffic.

Owing to the arrears in surface renewals, there has been further deterioration of the Basingstoke and London, and of the Bordon and Farnham Roads. The former especially, which is largely used, is very badly corrugated almost throughout, and the attention of the Road Board has again been called to its condition. In consequence it has been surveyed by one of the board's engineering inspectors, with the result that the board intimate that they will endeavour to assist the county council to carry out their ordinary maintenance programme by assisting to obtain labour and material, and will advise the railway company that facilities be granted for the transport of material. It is therefore hoped that at an early date it will be possible to deal with the worst portions of the road.

Two other main roads—the Salisbury and Romsey and the Poole, Ringwood and Romsey Roads—have been heavily worn; the latter road particularly needs attention as the gravel surface has been destroyed.

DAMAGE BY FROST.

In February many of the main roads which are on a chalk subsoil were very severely tried by the effects of an unusually severe frost. The disturbance of the road coatings in some parts of the county was greater than recorded on any previous occasion. The frost and thaw softened the subsoil to an unusual depth. Many of the surfaces were very severely tried by long convoys of motor lorries just as the thaw set in, where this happened the road soon collapsed, and there were no available stocks of material to enable even temporary repairs to be promptly carried out. It was necessary to watch and light some of the dangerous places at night.

Some roads, although overlying the chalk, were not appreciably affected, this doubtless being due (except in one case) to the absence of military transport traffic, and in some of the cases to the more substantial coatings of metal upon the roads. On the other hand, many main roads which were thinly coated with flint broke up very seriously under the combined effects of the thaw and military transport traffic, the latter continuing in some cases until the roads were quite impassable, when it was diverted on to the district roads.

It is satisfactory to report that on all hands ready and willing help was given by sending teams and labour so far as it was available to deal with the emergency. The chief engineer of the Southern Command and the Road Board placed at the disposal of the county council their resources, with the result that in the worst cases material was obtained to effect temporary repairs, and labour was told off by the military authorities to assist the work necessary to enable the roads to be thrown open for traffic. Very valuable and timely help was given by farmers, and a large number of their teams and men were employed upon the work, including Sundays. In consequence of these reinforcements of the very reduced staff of county workmen, who willingly worked long hours under great pressure, the roads were got into a passable condition in a very much shorter time than would otherwise have been the case. The complete restoration of the roads which have been broken up and destroyed in this manner—and which in most cases have merely been patched here and there in a very temporary manner, or were rolled roughly into shape before the soft chalk mixed with road débris had hardened—will prove a very formidable task, and will require a large quantity of material.

"DON'TS" FOR HOUSEHOLDERS.

A SOUTHALL-NORWOOD CIRCULAR.

The notice printed below has been issued in poster form by Mr. Reginald Brown, the engineer and surveyor to the Southall-Norwood Urban District Council, and represents his latest attempt to secure the co-operation of householders in the work of refuse collection and disposal:

SOUTHALL-NORWOOD URBAN DISTRICT COUNCIL

BE "ECONOMICAL" EVEN IN "WASTE."

DON'T

(1) Put into your dustbin anything which can, by any possible means, be utilised.
(2) Burn your paper; there is a serious shortage, and it will pay you to conserve it.
(3) Put any material in the dustbin which can be burned.
(4) Use the dustbin as a receptacle for any material of food value; if it cannot be utilised for human food much of it can be consumed by pigs, rabbits, and fowls.
(5) Put any wet material into the bin.
(6) Keep the bin uncovered, but see that the cover is always replaced, so as to keep the contents of the bin dry.
(7) Set fire to the contents of the bin.
(8) Place the dustbin in a position which causes needless walking on the part of the dustman, but place it in an easily accessible position at the entrance to the garden. A little labour on the part of EACH householder in taking the refuse to a bin placed in this position will save miles of the dustman's steps in the course of a week.
(9) Sweep the paper, &c., from your forecourts into the street, but pick the same up and burn all combustible material (except paper, for which see (2) above).
(10) Put any garden refuse into the bin, but bury it in the garden.
(11) Forget that every load of refuse saved means economy in collection and disposal of about 8s.
(12) Forget that it is to your personal interest to be economical in this matter.

REGINALD BROWN,
M.INST.C.E., M.I.MECH.E., F.S.I., F.R.SAN.I.,
Engineer and Surveyor to the Council.

Town Hall,
Southall, Middlesex
May, 1917.

Forfarshire and the Road Board.—The clerk of the Forfar District Committee of Forfarshire County Council reported recently that he had been in communication with the Road Board with regard to their intimation that in future grants and loans would be confined mainly to expenditure on the tar treatment of important roads. He had pointed out to the board that if the roads of the Forfar district were so treated the expenditure on maintenance would be doubled and that they could not face such a great increase of expenditure in the present circumstances. The board could not see their way to amend their scheme. On the suggestion of Mr. D. M. Graham, the chairman, the committee agreed that the attention of members of Parliament should be called to the matter.

CORRESPONDENCE.

Εις ἀνὴρ οὐ πανθ' ὁρᾶ

(One man does not see everything.)
— Euripides.

THE DESTRUCTION OF ROOKS.

To the Editor of The Surveyor.

Sir,—Your contributor of "Things One Would Like to Know," in The Surveyor of May 25th last, comments upon the destruction of rooks at Cheltenham, and I think most people will agree with him that it is a pity that the rooks were destroyed, and that such matters are not left to competent ornithologists to deal with.

As a general rule, the procedure seems to be as follows. Somebody shoots a rook, finds some grain in its crop, and at once writes to a newspaper to draw attention to the fact that "the rook is eating our food." Usual result, one more of these endless and futile committees, and the recommendation that a controller of rookeries (with staff) be appointed.

The question of balancing the amount of good rooks do against the amount of mischief is rarely considered. Imagine if our politicians were judged in a similar way—namely, by their baneful attributes while Parliament is sitting; obviously, the only fair way is to credit them with their better moments at other times.

It is well known that rooks eat large numbers of wireworm, cranefly, and cockchafer larvæ, and surface root feeders generally, and especially is this so during the breeding season, and the same applies to jackdaws.

It is probably impossible to say definitely whether a particular rook does more good by killing injurious insects than it does harm by pulling up wheat plant, &c., since it is not practicable to examine the contents of a rook's crop daily under natural conditions; there is, however, the strongest presumptive evidence that it does considerably more good than harm.

What is pretty certain is that these attempts to interfere with the balance of nature—especially where practically non-migratory birds are concerned—almost invariably meet with retribution sooner or later, generally in the form of some insect pest. Experience in other countries has been the same, and it may be of interest to quote from an entomological journal of the year 1858 concerning the Brussels Park:

"It appears that last year an unusual number of sparrows and other birds took up their quarters in the park, and, as in the case of the Guildhall pigeons awhile ago, they rendered themselves very obnoxious to the visitors. Complaint was made of the nuisance, and an order went forth that the sparrows should be destroyed. But it now turns out that in exterminating the birds the park-goers have got rid of one evil only to entail upon themselves a greater. Throughout the past summer the place has been swarmed with various insect pests, which have proved far more annoying than the birds, which before kept them in check. *H. Dispar* (the gipsy moth, now extinct in England) has been one of the chief offenders; in the larvæ state it stripped wellnigh all the trees of their foliage. . . . According to Kirby and Spence the good people of Brussels were similarly troubled by this insect in 1826, and if the authorities then had known what those authors say on the subject they would probably have saved themselves some annoyance, and remained guiltless of the slaughter of their feathered protectors."

Many other instances might be cited, one of them concerning rooks. In view of the fact that many areas of land are under cultivation this year for the first time in recent years, it is quite probable that we may have a number of fresh insect pests disturbed and distributed over previously immune areas, and, as a result, possibly smaller crops generally than [illegible] year paper could not do a much more useful national service than by discouraging the destruction of birds of all kinds, leaflets from Government Departments notwithstanding.—Yours, &c.,

G. Bertram Kesshaw, F.E.S.

9 Victoria Street, S.W. 1.

"LOOKING AHEAD."

To the Editor of The Surveyor.

Sir,—With reference to your correspondent's article under the above heading in your issue of May 25th, may I be permitted to point out that the question of concrete roads has frequently been discussed in the pages of your journal, and that such roads have so far been shown to be a failure in practice? Also, with regard to the section he gives of the type of "looking ahead" road, I fear that in practice it would be a failure for the following reasons:

(1) The cambered perforated metal gratings placed between the tramway rails would produce a most terrible noise as the car passed along them.

(2) Only a single line of tramway could be constructed, an unthinkable proposition.

(3) The perforations would soon become choked and the road would be flooded.

(4) Horses travelling on the cambered perforated metal gratings would have an unpleasant time, and the rattle of their hoofs thereon tend to frighten them, and also disturb the nerves of pedestrians.

(5) Your correspondent is wrong in his statement that dust is produced by suction under self-propelled cars; it has been proved over and over again that fine dust laid in a track between the wheels of a fast moving car is not disturbed thereby, and that it is the revolving wheels that pick up the dust and throw it broadcast.

(7) The concave section for a carriageway is weak in construction, and is also dangerous to traffic, as the camber causes vehicles to lean *towards* each other.

I am sorry to throw cold water on your correspondent's suggestion, but he must try and produce a more practical design for the road of the future than this, and give us the proper section of a road *without* any tram line on it; except in very broad roads, this means of locomotion will not continue for many more years, as since the advent of the self-propelled motor-omnibus it has become almost prehistoric.—Yours, &c.,

Sceptical.

May 29, 1917.

QUICKLIME FOR BLASTING.

To the Editor of The Surveyor.

Sir,—In "Things One Would Like to Know," in your issue of May 25th, allusion is made to the use of quicklime instead of explosives for blasting purposes. It may interest your readers to know that in the White Cliff Opal Mines, in New South Wales, where the opal is quarried, quicklime has been extensively used to tear away the matrix from the face, as very high explosive would batter the brittle but valuable opals. Here is a case in point where the disruption can take place without any destruction of the materials which form part of the mass to be dislodged. Can your readers give any further experiences or cases where quicklime is used for blasting?—Yours, &c.,

Inquirer.

May 30, 1917.

THE SAFETY OF SEWERMEN.

To the Editor of The Surveyor.

Sir,—Should not a box gas helmet similar to those in use by the army be part of the equipment of sewermen?

Although it is hard to work when wearing the helmet, it should be worn when working in known dangerous sewers, and kept ready for rescue work at other times.

If not at present effective against sewer gases, chemically or otherwise, could it not be made so? The expense would be small.—Yours, &c.,

Sapper.

May 29, 1917.

Mushroom Roads.—Frenchmen are much impressed by the skill of Victor Emmanuel's soldiers as road-makers. Deputies just returned, giving their impressions, tell this story (says the London *Evening News* Paris correspondent). An Italian officer, hesitating one day at crossways, asked the sentry which was the shortest cut. "How should I know," said the sentry, not recognising the rank of his questioner, "with this mad Maglietta making new roads every night?" General Maglietta, famous throughout the army, belongs to the general staff of engineers. He is the directing genius responsible for roads without number, lines of concrete trenches constructed in the rear by an army of 200,000 workmen and forming an invisible network.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. *The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.*

EXTRAORDINARY TRAFFIC.—"Nartex" writes: There is a narrow country lane in this district on which the ordinary traffic for some time past was confined to a few farm carts and wagons. The metalled road, except at one or two points, is not wide enough to admit of two vehicles passing one another without diverging on to the grass wastes at the sides. In the course of last year the lane was used by a number of contractors' carts, carting large quantities of building materials, in connection with alterations and additions to a hospital. A long string of these carts passed along almost daily for many months. The surface of the road was soon cut through, and the carts then diverged on to the grass wastes. The rural district council did what was possible during the traffic to keep the road surface repaired with local gravel, but in the course of the winter it became almost impassable, and scarcely distinguishable from the wastes, which were also cut up. The council are now advised that the only practicable method of repairing the road satisfactorily is to re-coat the whole, including the grass wastes, with granite, so as to allow for two lines of traffic. Would you kindly advise me whether, in the event of their so doing, the council could recover the whole of the cost from the parties responsible for the extraordinary traffic, or whether an allowance would have to be made for the "betterment" of the road?

In my opinion, assuming that this is the only practicable method of adequately repairing the damage done by the traffic in question, so that the cost can fairly be said to be "expenses incurred by reason of" such damage, the full amount would be recoverable, without any deduction for "betterment." See *Swain* v. *Oswestry Highway Board* (44 J.P., 766); *Hertfordshire County Council* v. *Austin* (referred to in "The Law of Extraordinary Traffic on Highways," by Barnard Lailey, p. 70).

BUILDING LINE: PUBLIC HEALTH (BUILDINGS IN STREETS) ACT, 1888, SEC. 3.—"Lineal" writes: A and C are owners respectively of two plots of land fronting on a new street, and about 100 ft. apart. There are at present no buildings in existence on the same side of the street. Some short time since both owners submitted plans for the erection of houses. A's plan showed that the house proposed to be erected on his plot was to be set back 10 ft. from the street boundary, but C's plan showed the proposed house set back 6 ft. only. A's plan was approved, but C's plan was disapproved. A recently commenced the erection of his house—that is to say, he put in the foundations and raised the front main wall to a height of 6 in. or 7 in. above them, though not above the level of the street. C has now commenced to build the front main wall of his house, in accordance with his plan, notwithstanding its disapproval, setting back 6 ft. only—*i.e.*, 4 ft. in front of A's main wall. I shall feel greatly obliged if you will be so good as to advise me whether, in your opinion, the urban district council can compel C to set back to the line of A's building—*i.e.*, 10 ft. from the street?

Having regard to the distance between the plots, and to the inchoate state of A's front main wall, I think it is extremely doubtful whether C can be compelled to set back. In *Ravensthorpe Local Board* v. *Hinchcliff* (59 L.J.M.C., 19), it was held, upon somewhat similar facts, that there had been no contravention of the Public Health (Buildings in Streets) Act, 1888, sec. 3, on the following grounds—viz., (*a*) that there was no "front main wall of a house or building" on the plot corresponding to A's plot in the present case; and (*b*) that "house or building on either side" means a house or building within some degree of proximity, and not one standing a considerable distance away.

THE SEWERING OF NEW STREETS.—"T. D. C." writes: A landowner in this district has submitted plans for the laying out of a building estate, and the erection of several blocks of houses, comprising several streets. The plans show a separate drain for each house, ending in the middle of the street, but no sewers are shown, nor any cesspool or other receptacle for drainage. The owner has been requested to amend the plans by showing into what sewers, or other means of drainage, the drains are to discharge. He, however, refuses to do so, and contends that it is for the council to provide the necessary sewers. I enclose a copy of our by-laws, and shall be obliged by your advising me, through the medium of your "Law Notes" column, whether the council can insist upon the plans being amended in accordance with their requirement?

In my opinion, assuming that the houses and drains comply with the by-laws, the council cannot insist upon their requirement, but are bound to approve the plans as they stand. See *Regina* v. *Tynemouth Rural District Council* (60 J.P., 804). Of course, they can throw the expense of sewering the streets upon the frontagers by proceeding under sec. 150 of the Public Health Act, 1875, or (if adopted) under the Private Street Works Act, 1892.

GREENSWARD ADJOINING PUBLIC ROAD.—"G. S. R." writes: There is an old public road in this (rural) district, bounded on one side by a steep bank, with an irregular, straggling hedge at the top, and on the other side by a strip of green sward, partly overgrown by trees and underwood, and separated from the adjoining land by a straight, artificial hedge. The adjoining landowner and his predecessors have been in the habit of taking soil from the strip, and also cutting wood, for their own use; but the public have for many years past used it as part of the highway, when the road has been impassable, and the highway authority for the time being have taken gravel from it for road purposes whenever required. The landowner now proposes to enclose it with a brick wall. I shall be obliged if you will advise me whether the rural district council can prevent him from doing so?

In my opinion they cannot. Having regard to the character of the ground, and to the acts of ownership by the landowner and his predecessors. I do not think the strip would be held to form part of the highway. See *Attorney-General* v. *Lindsay-Hogg* (76 J.P., 450).

SEWER CONSTRUCTION: COMPENSATION TO LANDOWNER.—"Nywloc" writes: Several years ago my council had occasion to construct several sewers in private land, and compensation was duly assessed and paid to the landowner, under sec. 308 of the Public Health Act, 1875. The council have recently connected these sewers with a pumping station, reservoir and outfall sewer, which have been constructed on adjoining land belonging to another owner, thus forming one system of sewerage. The first-mentioned owner now contends that these additional works tend to depreciate the value of his land, and that, as such works and the sewers on his land form one system of sewerage, he is entitled to further compensation. Will you kindly let me have your valued opinion, in an early issue, as to whether the council can be compelled to pay him any further compensation?

In my opinion the landowner is not entitled to, and cannot compel the council to pay any further compensation. See *Worton* v. *Colwyn Bay Urban District Council* (21 T.L.R., 220).

DISQUALIFICATION OF URBAN DISTRICT COUNCILLOR.—"D. Q. F." writes: The urban district council have entered into a contract with a gas-fitter to make extensive alterations in and additions to the gas-fittings in their offices. In order to carry out the work properly it will be necessary to erect scaffolding, &c., and for this purpose the contractor proposes to employ one of the members of the council, who is a local builder. Will you be good enough to let me have your opinion, through the medium of THE SURVEYOR, as to whether such an arrangement would be legal while the builder continues to be a member of the council?

In my opinion it would not, as the councillor would thereby become "concerned" in the contract with the council, and, under sec. 16, subsection 11, of the Local Government Act, 1894, he would thereupon become disqualified. Should he act as a councillor after such disqualification he would incur a penalty of £20 under sub-section 8. See *Tomkins* v. *Ashby* (51 J.P., 247).

DEATH OF MR. WILLIAM HARPUR.

CITY ENGINEER OF CARDIFF, AND PAST-PRESIDENT OF THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

Mr. William Harpur, M.Inst.C.E., city engineer of Cardiff, whose death at the age of sixty-five we deeply regret to record, was the son of the late Samuel Harpur, one of the founders of the Institution of Municipal and County Engineers, and was thus, in a sense, born into the profession of municipal engineering. He was attached to his father, and his first official appointment was that of deputy to the Merthyr Local Board. When twenty-four he obtained the position of first deputy engineer of Cardiff, and held this for thirteen years, when he was appointed borough engineer by the unanimous vote of the city council. The

The Late Mr. William Harpur.

growth of Cardiff has been little short of phenomenal, and during the period of the city's greatest expansion Mr. Harpur was offered continuous opportunities for the practice of his great engineering skill. He was an enthusiastic supporter of the town-planning movement, and the width of the newer streets of Cardiff and the monumental character of all works of a public nature he carried out may be ascribed largely to his enlightened views. He shunned showy designs, and set his face firmly against cheap constructional work.

In addition to being a member of the Institution of Civil Engineers Mr. Harpur was a Fellow of the Surveyors' Institution and of the Royal Meteorological Society, a member of the Royal Sanitary Institute, and a past-president and member of the Institution of Municipal and County Engineers. He was also president of the Institute of Cleansing Superintendents. He leaves a widow, one daughter, and six sons, among the last-mentioned being Captain Lewis Harpur, R.E., county road surveyor of Breconshire, now in France, and Mr. Charles Harpur, deputy surveyor at Shanghai, China.

Among the messages received by Mrs. Harpur is the following from Mr. E. George Mewburn, borough engineer and surveyor of Leicester, and a past-president of the Institution of Municipal and County Engineers: "Please accept deepest sympathy and condolence in sad bereavement from one of many who loved [illegible] esteemed colleague and friend."

War Bonus for County Council Staff.—Northants County Council have agreed to a recommendation to grant a war bonus to the departmental and clerical staff who were in permanent employment of the council at the outbreak of the war as follows: A 7½ per cent bonus to married employees receiving between £200 and £300 a year, and 10 per cent to married and 7½ per cent to single employees receiving under £200 [illegible] to be based upon not more than 35s. a week.

TESTS OF ROAD-MAKING STONE.

VARIATIONS IN CRUSHING STRENGTH.

Bulletin No. 537, just issued by the United States Department of Agriculture, gives the results of the more common physical tests of road-building rock examined by the Office of Public Roads and Rural Engineering in 1916. The office tested 396 samples of rock in that year, the results of which tests are given in a table, the rocks being classified according to their location. In a number of cases, in addition to other tests, the crushing strength of the rock also is given. This test is not made ordinarily when examining rock to determine its suitability for use in various types of broken-stone roads. The test is employed often, however, when considering a rock for use in the manufacture of paving block, and as many requests for records of the crushing strength of various rocks have been received in the past year, it has been thought advisable to give in a table a complete record of all the crushing-strength tests made by the office up to January 1, 1917.

The compression test is made upon a cylindrical test specimen 2 in. in diameter and 2 in. high. Both ends of the specimen, which have been sawed at right angles to the axis of the cylinder, and properly faced, are bedded in plaster of Paris. The cylinder then is crushed in a 200,000-lb. universal testing machine. A small 2-in. spherical bearing block is placed between the moving head of the machine and the upper surface of the specimen. The average of at least two determinations is reported as the crushing strength, calculated in pounds per square inch.

Of a total of 282 compression tests made up to

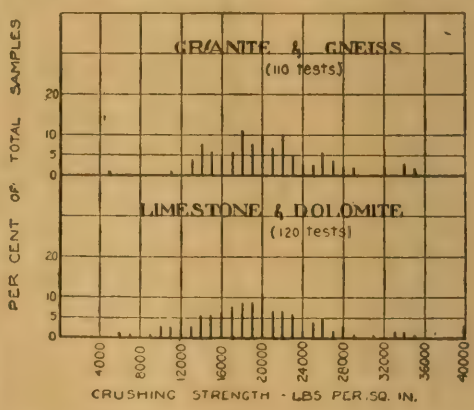


Fig. 1.—Variations in the Crushing Strength of Stone.

January 1, 1917, 97 were made on granites, 13 on gneisses, 78 on limestones, 42 on dolomites, 28 on sandstones, and 24 on various other types of material.

The percentage variation in the strength of the 110 granites and gneisses and the 120 limestones and dolomites is shown graphically in Fig. 1. In this chart the per cent of total samples tested having various values for crushing strength are plotted as indicated. For instance, the chart shows that 10 per cent of all granites and gneisses tested show a crushing strength of 20,000 lb. per sq. in. Likewise, by summing up all the per cents to the left of the 20,000-lb. line we find that 48 per cent of all samples of granite and gneiss tested have a crushing strength of less than 20,000 lb. per sq. in., which shows that the average crushing strength of this type of material lies between 19,000 lb. and 20,000 lb. per sq. in. Likewise, the average crushing strength of the limestones and dolomites lies between 18,000 lb. and 19,000 lb. per sq. in.

The Tar-spraying Season.—Messrs. John Yates & Co., Limited, Aston Manor, Birmingham, have received from the Road Board orders for three of their improved 1917 tar-sprayers for use on military roads.

A Pony for £3. In view of the high price of horses it is interesting to read that the Ripon City Council recently passed a resolution authorising the city surveyor "to purchase an old pony that he had had the loan of for work on the sewage farm at a cost not exceeding £3."

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Cheshunt U.D.C.—The question of providing a public slaughter-house has been referred to the Sanitary Committee. The surveyor, Mr. J. E. Sharpe, is preparing amended plans, as sanctioned by the Local Government Board, for the provision of small pox hospital accommodation of a semi-temporary type.

Huddersfield T.C.—The question of a new public library, to include accommodation for the art gallery and museum, is being considered.

HOUSING AND TOWN PLANNING.

Launceston T.C.—A sum of £1,000 has been bequeathed to the town council by the late Mr. T. H. Nicolls to build or provide a block of model cottages, to be let at a reasonable rent.

Mirfield U.D.C.—It has been agreed to purchase land for the erection of working-class houses.

Newton Abbot U.D.C.—The medical officer of health reported, with respect to the housing of the working classes, that building remained at a standstill, and only four habitation certificates, two of which were for bungalows, were granted during the year. The house-to-house inspection had been discontinued for the present. The need for more cottages was still urgent.

Stow R.D.C.—The Housing Committee recommend the council to build forty more houses at Stowupland, Buxhall, Haughley, Creeting St. Peter, and Combs.

MOTOR TRANSPORT.

Bingley U.D.C.—A committee has been asked to report upon a proposal to purchase a motor wagon for the highways department.

East Suffolk C.C.—The council have agreed to the purchase of a motor ambulance for Ipswich.

REFUSE COLLECTION AND DISPOSAL.

Northwich U.D.C. The Local Government Board have asked the council to submit plans of the proposed dust destructor with a view to the work being commenced as soon as possible after the close of the war.

Worcester T.C.—The General Purposes Committee reported that instead of purchasing a machine for baling waste-paper they had accepted the offer of a loan of one from Messrs. T. Owen & Co., of Cardiff, the company taking all waste-paper at £3 10s. a ton and paying the carriage. The machine had arrived, and 2 tons of paper had been baled and sent off.

ROADS AND MATERIALS.

Bedale R.D.C.—The surveyor, Mr. T. W. Metcalfe, has been authorised to purchase two snow ploughs.

Berks C.C.—The Road Board have intimated that they will be prepared to make a grant of £1,500 towards the cost of surface tarring during 1917-18. It is also intimated that the board will be prepared to recommend the War Department to make a contribution in aid of the resurfacing sections of the Newbury and Abingdon road.

Bristol T.C.—An intimation has been received that the Road Board have sanctioned a grant of £5,000 towards the cost of resurfacing the Bristol to Avonmouth road. The total cost of the work is estimated at £8,000.

Chislehurst U.D.C.—It was reported that the Road Board had agreed to make a series of grants to meet part of the cost of road repairs rendered necessary by extraordinary traffic.

East Grinstead U.D.C.—The urban council and the inhabitants generally of East Grinstead (the *Sussex Daily News* states) have every reason to be proud of the roads of their town, which, in spite of the difficulties in regard to getting material in war time, are in an excellent condition and now that the tar paving has been nearly completed the dust nuisance has been reduced to a minimum. It is often remarked by visitors that East Grinstead is a very clean town, and the surveyor, Mr. W. E. Woollam, is to be congratulated on being able to maintain its reputation in spite of shortage of staff. Tar-macadam has during the last few years in several places replaced the usual surface, and this is a great improvement, and must be a great economy in the long run. There is a large amount of through traffic at East Grinstead even in normal times, and this has been considerably increased, especially in regard to heavy vehicles, during the last year or two, but the excellent roads have proved capable of bearing the additional burden.

Eastleigh U.D.C.—It has been decided to purchase a tar-spraying machine for £74.

Gourock T.C.—It has been decided to make use of the steam wagon for watering the streets. It is proposed to use salt water, and a pump is to be purchased for £7 10s.

Hayes U.D.C.—The Road Board intimate that they have recommended the Ministry of Munitions to contribute £4,335 towards £7,635 required for the widening and making of a road continuing Station-road by Coldharbour-road and Yeading-lane to West End.

Helston (Cornwall) R.D.C.—It was reported that the Road Board had granted £200 towards the repair and tar-spraying of the Cury to Double Lodges road. The question was raised whether the contribution would adequately cover the cost of tar-spraying, and in the circumstances the matter was referred to the South Committee.

Monks Kirby R.D.C.—A letter was received from the county council with regard to the Road Stone Control Committee appointed by the Ministry of Munitions, and the surveyor, Mr. A. J. Ross, was asked to prepare a plan of the roads which he considered of national importance having regard to their use by traffic connected with war work, together with the tonnage and nature of the material used on each road.

Scarborough T.C.—The borough engineer, Mr. H. W. Smith, has been instructed to report on the advisability of installing an asphalt-mixing plant.

Southampton C.C.—The county council have authorised the Main Roads and Bridges Committee to spend £1,045 on the widening of the Portsmouth-Petersfield main road in the vicinity of Liphook.

Uckfield R.D.C.—The Road Board have authorised the council to carry out road works for military purposes, at an estimated cost of £3,860.

Westminster B.C.—The council are recommended to contribute one-sixth of the nett cost (£87,500), not exceeding £14,583, of the widening of the Strand at Nos. 125 to 130 inclusive, and 1 to 15, Wellington-street; also 10, Lancaster-place, including the acquisition of the leasehold interest of Messrs. Willing in No. 125, Strand. The council are informed that if advantage is not now taken of the favourable opportunity of widening Wellington-street on the west side, the cost later on may be a prohibitive one.

SEWERAGE AND SEWAGE DISPOSAL.

Abingdon T.C.—The town council are considering the purchase of land for the extension of the sewage disposal works.

Bridgwater R.D.C.—The council have applied to the County Works Committee for an extra grant towards the cost, estimated at £317, of new drainage works.

Blyth and Cuckney R.D.C.—The sanitary surveyor has been instructed to prepare a report on the sewerage and water schemes that will be necessitated by the proposed colliery developments at Firbeck and Haworth.

Buckingham R.D.C.—It has been decided to extend the sewer at Charndon for a length of 60 yards.

Leigh (Lancs) R.D.C.—The council are considering a sewerage scheme for Culcheth.

Leyton U.D.C.—It was reported that the Public Health Committee were negotiating with the L.D. Water Purification Processes, Limited, in reference to a proposal to instal a plant for the treatment of sewage.

West Ham T.C.—Attention was called to the fact that the borough engineer, Mr. J. G. Mealey, had made an application to the Ministry of Munitions for

a permit for material to be used in cases of emergency at the sewage pumping station, but that he had not been successful in getting a permit. If, it was stated, there was a breakdown of the machinery at the present time, probably West Ham would be in a rather serious state. The town council resolved to ask the Ministry of Munitions to receive a deputation with respect to the matter.

Westminster B.C.—The Drainage Committee recommend the city council to carry out drainage work in Lees-mews, Robert-street, and Shepherd's-place, at an aggregate estimated cost of £655.

WATER, GAS, AND ELECTRICITY.

Finchley U.D.C.—The Local Government Board have intimated that they are unable to sanction the loan of £14,000 asked for by the council for proposed extensions to the electricity undertaking.

Hull T.C.—The Water and Gas Committee are making an appeal to the public to economise in the use of water, particularly in connection with baths and outside taps. The engineer said that economy would result if the committee were to abolish outside taps, but he was requested "not to raise that question again."

Manchester T.C.—The chairman of the Waterworks Committee, Sir Edward Holt, in a statement with respect to the consumption of water, said that, while there had been a reduction of thirty-four days' supply, there had been an increased consumption of over 5,000,000 gallons compared with May last year. At Thirlmere there had been a rainfall of 22 inches less than last year, and at Longdendale the rainfall had been several inches less. At present, Sir Edward added, there was an extravagant use of water in the city, and he warned citizens to reduce their consumption. He would not hesitate, when the time came, to reduce the supply.

Newport (Mon.) T.C.—The Electricity Committee recommend an increase of 10 per cent in the charges for electric light.

Nottingham T.C.—The Water Committee report that a notice has been received by the Derwent Valley Water Board from the corporation of Sheffield to construct works sufficient to provide the total remaining quantity of water to which that corporation is still entitled. In considering this application the Derwent Valley Water Board have asked that they may be informed whether the Nottingham Corporation can spare any of the water to which they are entitled from the board's works, which might be offered to the Sheffield Corporation for the ensuing twenty years, and, if the corporation cannot spare any of such water, but, on the other hand, may require a further instalment, the board should be furnished with particulars within a reasonable time of the Nottingham requirements so that any new works that may be undertaken for the Sheffield demand may be so designed as to suit the requirements of Nottingham. The matter (says the *Nottingham Guardian*) has been fully and carefully considered, and the Nottingham Committee have had a full report from the water engineer. In view of the continually increasing demand for water from the city and the surrounding area within the limits of the water undertaking, it is estimated that the yield from the sources from which the water supply is now obtained, including the existing supply from the Derwent, will only be sufficient at the end of ten years from the present time to meet the normal demand at that date, and that unless additional supplies are obtained the present resources would be insufficient to meet the anticipated demands. Under these circumstances the committee propose to reply that the corporation cannot spare any of the remaining water to which they are entitled from the Derwent Valley Waterworks, and that the further instalment to which they are entitled should be provided within the next ten years, and that the board be therefore furnished with particulars as soon as possible of the quantity required, and at what date the corporation will require that supply. They recommend the council, at its meeting on Monday, to approve this decision, and to take the necessary steps to obtain the supply to which they are entitled.

Poplar B.C.—The Electricity Committee recommend the laying of another extra high-tension cable from the generating station to the Stepney boundary, and the purchase of an additional 5,000-kw generating set.

Stafford T.C.—It was reported that the nett profit of the water undertaking was £1,038, of which £1,000 are to be applied to the reduction of the rates.

MISCELLANEOUS.

Oystermouth U.D.C.—The council have agreed to enter into negotiations with the Estates Company with a view to the acquisition of the open space at Mumbles lately occupied by an aerial railway. It is suggested that the ground should be converted into a park or winter garden.

Newport (Mon.) T.C.—The town council are considering a scheme for the extension of the tramways from the Pill terminus to the Alexandra Dock gates.

Plymouth T.C.—With reference to the tramway undertaking the chairman of the Tramways Committee stated that the condition of the track and of the cars was such that, together with the lack of men, particularly mechanics to repair them, he thought he should make it clear how extremely difficult it was to maintain the present service. It was possible it would be necessary to reduce it.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATION FOR LOAN.

Ilford U.D.C.—£5,800 for a steam-power scheme at the refuse destructor.

LOANS SANCTIONED.

Aylesbury T.C.—£6,000 for electricity plant.

West Ham T.C.—£12,100 for a water-tube boiler and auxiliary plant at the electricity works.

Wolverhampton T.C.—£2,410 for electricity mains.

LONDON'S WATER.

DR. HOUSTON'S SUCCESSFUL WORK.

The eleventh annual report of Dr. A. C. Houston, Director of Water Examination to the Metropolitan Water Board, was submitted to that authority at its meeting on Friday last, when the Water Examination Committee called attention to the following points:

The special treatment of the raw Thames river water has been in operation from June, 1916, to date, with intermissions due to floods.

The consumers have received a tasteless, odourless and innocuous water.

The treated water has been purer bacteriologically than if it had undergone storage in the Staines reservoirs.

From June to March the nett saving has been over £8,000.

Still more important is the conservation of coal, a commodity of vital use to a nation at war.

These results proclaim the eminently successful work of Dr. Houston and his staff, fraught with results of such great scientific and economical value.

The New River supply is open to some criticism, owing to the deficiency of storage and of filtration area.

The results are very good under normal conditions, but the moment a flood occurs deterioration sets in. To remedy this state of affairs by the construction of engineering works would cost an enormous sum of money. Moreover, the larger reservoirs and additional filters are only really needed on exceptional occasions.

The Director has therefore sought to solve the problem. He frankly admits that his first attempt was unsuccessful owing to taste troubles. Since then most gratifying results have been obtained and some of the members of the board have had ocular demonstration of the working of the process.

The success of these experiments, needless to say, depends on the cordial co-operation of the engineering department.

ALGAL TROUBLES.

We now pass to the subject of algal troubles, which has given us much concern.

The Director is in favour of a bold anticipatory algal policy, and we are in touch with the works and stores department on the subject.

It appears that both copper sulphate and chlorine in doses varying, broadly speaking, from 0·1 and 1·0 part per million parts exercise a marked inhibitory power on algal growths, but it has been shown by the Director that the treatment, to be successful, should be put into operation at the very commencement of the trouble.

PERSONAL.

Mr. J. Twemlow, surveyor to the Ashbourne Rural District Council, has been gazetted first lieutenant on the recruiting staff.

Mr. Ernest Mansergh has been appointed consulting engineer by the Lancaster Town Council in connection with the proposed scheme for the extension of the water supply.

Mr. George Lee, county surveyor of Galway, has received permission from the county council to join the forces, and Mr. E. O'Malley has been appointed deputy county surveyor during his absence.

Mr. W. R. Puddicombe, surveyor to the Oystermouth Urban District Council, has been called up for military service, and the council have decided to make representations to the military authorities with a view to having his time extended, the council in the meantime to advertise for a substitute, who must be over military age.

Lieut. H. A. Butterfield, Royal Engineers, who has been severely wounded, was formerly assistant surveyor to the Wath Urban District Council, and more recently assistant to the borough surveyor of Batley. The billet in which he was settled was heavily shelled by the enemy, and Lieut. Butterfield, who was fully dressed and in bed, was hit in the chest by a piece of shrapnel, which passed through a portion of his left lung and came out at the back. He is progressing favourably.

Charles Crawford, formerly employed by the Westminster City Council as a street sweeper, has been awarded the Military Medal "for conspicuous devotion to duty, taking full charge, owing to the shortage of officers, and leading his platoon against German trenches." He was a reservist in the 1st Border Regiment, and was promoted to sergeant. William Sullivan, another street sweeper in the employment of the same authority, has also received the Military Medal "for good work in command of his platoon." He is a sergeant in the Royal Fusiliers, and was a reservist.

The following increases of salary have been voted by the Glasgow Corporation: City engineer's and master of works department: Mr. F. G. Holmes, engineer, 19 years' service, £550 to £575; Mr. John Bryce, engineer, 20 years' service, £525 to £575; Mr. Daniel M'Innes, engineer, 26 years' service, £320 to £350; Mr. Wm. Sharp, architect, 27 years' service, £350 to £400; Mr. R. W. Horn, architect, 21 years' service, £300 to £350; and Mr. James Dunn, clerical staff, 53 years' service, £300 to £330. Water engineer's department: Mr. J. R. Sutherland, chief engineer, 28 years' service, £1,000 to £1,250, by annual increments of £50. Health department: Mr. Peter Fyfe, chief sanitary inspector, 37 years' service, £900 to £1,000; Mr. Henry Watt, junior sanitary inspector, 36 years' service, £300 to £350.

Cutting Off the Water Supply.—A question affecting the powers of the Metropolitan Water Board to cut off the water supply at the request of a landlord was raised at the hearing of a case at Wimbledon on Friday last. A solicitor contended that the board had no right to cut off the water before making sure the premises were not habited; and the Water Board replied that a tenant could get water restored by paying the rate and deducting this from the rent.—The magistrate thought this should be known by the public.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF HEMEL HEMPSTED.
BOROUGH SURVEYOR'S DEPARTMENT.

Applications are invited for the position of Assistant Clerk from persons ineligible for military service, during the absence of man now serving with the Colours.

Salary according to experience.

WALTER R. LOCKE,
Borough Surveyor and Waterworks Engineer.

Town Hall,
Hemel Hempsted.
May 30, 1917. (3,423)

LOCAL AUTHORITIES AND THE SUPPLY OF COAL.

QUESTIONS IN THE COMMONS.

In the House of Commons, Mr. Rowlands asked the President of the Board of Trade whether the Hammersmith Borough Council had been informed by his Department that local authorities should buy and store coke for distribution in the winter; and, if so, whether he would now extend the same instruction to local authorities in regard to coal.

Mr. Roberts: It is the fact that the Hammersmith Borough Council are, with the approval of the Controller of Coal Mines, undertaking arrangements for the distribution of coke during the winter. As regards the supply and distribution of coal, I indicated in my reply to a question asked by the hon. member for the West Newington Division on April 19th the steps that have been taken to ensure supplies from the colliery districts normally supplying London, and as the position still gives cause for apprehension the Controller of Coal Mines is making arrangements for additional supplies from other districts. As I stated on May 16th, proposals for dealing with the problem of distribution during the coming winter are receiving the controller's careful consideration, but it is not possible at present to say definitely how far or in what directions it may be necessary to invoke the assistance of the local authorities.

Mr. Rowlands: Can the hon. gentleman say whether it is not a fact that the Coal Retail Prices Committee, in their Report in 1915, unanimously recommended the consideration of the Government to asking the London County Council and the other public authorities to sell coal, and can he say why, if the Hammersmith Borough Council is to be allowed to store coke, they should not be allowed to store coal?

Mr. Roberts: The hon. member is quite right with respect to the recommendation to which he refers, and I have stated nothing which in any way is out of harmony with that recommendation. The whole matter is receiving the very careful consideration of the Coal Controller, and if he subsequently finds that public authorities are the best means of securing better distribution he will have no hesitation in availing himself of their services.

COAL FROM CONCRETED BREEZE, SAWDUST AND ASHES.

The above is the subject of a paper which Mr. R. Goulburn-Lovell, A.R.I.B.A., will read at a meeting of the Society of Architects, to be held on Thursday next, the 7th inst., at 28 Bedford-square, London, W.C., at 6.30 p.m. It is claimed that by a combination of the materials named it is possible to produce a good fuel which will flame, coke and incandesce like coal. This will be demonstrated at the meeting.

Engineers and Military Service. — "U. D. C." writes: "I should be glad if any of your readers could inform me whether it is the general rule for surveyors holding the post of water engineer to be exempt from military service."

Municipal Employees' Wages.—It was stated at the annual conference of the National Union of Corporation Workers, which was held in London on Monday last, that the union had approached all councils with a view to obtaining a rise of 10s. on pre-war rates in the wages of all employees. Several councils, including those of St. Pancras, Bethnal-green, and Dewsbury, had acceded, and councils generally were of opinion that the application was worthy of consideration.

Keighley Electricity Undertaking.— Yesterday (Thursday) the formal opening took place of the extension of the Keighley Corporation's electricity undertaking. The first power station was opened in 1901, with a plant of 440 kilowatts output, the total cost of plant and distributing mains being £39,300. The demand for power increased, and several additions were made to the plant and premises until, at the end of March this year, the outlay on the works had reached a total of just over £146,000. In a souvenir booklet, Mr. Harry Webber, the borough electrical engineer, gives the history of the department, and states that while municipal electricity undertakings are usually looked upon by the public as more or less maintained from the rates, the Keighley works have been for the past five years entirely self-supporting, with a fairly reasonable margin of profit going to the reserve fund, while paying a fair proportion out of revenue towards the General District Fund.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

VISIT TO WORCESTER SEWAGE WORKS NEXT WEEK.

We are asked to state that arrangements have been made for a meeting of the West Midland District of the Institution of Municipal and County Engineers to be held at Worcester on Saturday week next, the 9th inst., at 5 p.m. The main purpose of the gathering is to hold an inspection of the sewage works and the important experimental work in connection with the activated sludge process at present under observation.

ANNUAL MEETING: PROVISIONAL PROGRAMME.

The following are the arrangements which have been made up to the present in connection with the 44th annual general meeting of the institution, which is to be held at Hastings on June 28th, 29th, and 30th:—

Thursday, June 28th.

General business of the institution.

Presidential address and presentation of premiums.

Conference.

Friday, June 29th.

Conference.

Lunch at the Town Hall, Hastings, by invitation of the Right Worshipful the Mayor of Hastings.

Visit to the Brede Valley Waterworks of the Hastings Corporation. Tickets, 4s. 6d. each.

Smoking concert at the Albany Hotel, Hastings.

Saturday, June 30th.

Visit to Battle Abbey, by kind permission of Sir A. Webster, Bart. Tickets, 4s. 6d. each.

PRELIMINARY LIST OF PAPERS.

1. "Public Abattoirs," by H. A. Brown, engineer and surveyor to the urban district council, Weston-super-Mare.

2. "Extraordinary Traffic and Excessive Weights on Highways," by H. T. Wakelam, M.INST.C.E., county engineer, Middlesex.

3. "Examinations," by E. Willis, A.M.INST.C.E., engineer to the urban district council, Chiswick.

4. "Dry Rot," by E. J. Goodacre, A.M.INST.C.E., assistant borough surveyor, Shrewsbury.

5. "Some Municipal Works of Hastings," by G. F. Miller, assistant borough engineer, Hastings.

The president-elect (Mr. P. H. Palmer) will be glad to receive offers to read papers at the meeting.

INSTITUTION OF MUNICIPAL ENGINEERS.

GENERAL MEETING IN LONDON.

A general meeting will be held in London, at No. 4, Southampton-row, W.C.1, on Wednesday next, at 6 p.m., when a paper "House Refuse: Its Calorific Value and its Possibilities," will be presented for discussion by Mr. Reginald Brown, M.INST.C.E., M.I.MECH.E., F.S.I., F.R.SAN.I., &c.

The chair will be taken at 6.30 by Mr. Henry C. Adams, M.INST.C.E., M.I.MECH.E., F.R.SAN.I., the Acting President of the Institution.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ROAD FOREMAN.—June 4th.—Hendon Urban District Council. 53 9s. per week. Engineer and Surveyor, Council Offices, Hendon, N.W.

SEWAGE WORKS FOREMAN.—June 4th.—Corporation of Halifax.—Borough Engineer, Town Hall, Halifax.

ASSISTANT SURVEYOR.—June 5th.—Wicklow County Council. £150 a year, with £20 for expenses.—Mr. S. J. Doyle, secretary, Courthouse, Wicklow.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 5th.—Oystermouth Urban District Council. £150 a year.—Mr. J. H. Robinson, clerk, Council Offices, Oystermouth, near Swansea.

SURVEYOR AND ENGINEER.—June 9th.—Sheerness Urban District Council. £300–£400 a year.—Mr. Vincent H. Stallon, clerk, Council Offices, Sheerness.

FEMALE SANITARY INSPECTOR.—June 11th.—Ealing Borough Council. £100 a year.—Mr. T. Orr, medical officer of health, Public Health Department, Town Hall, Ealing, W. 5.

ARCHITECTURAL ASSISTANT.—June 11th.—Bedwellty Urban District Council. £150 a year.—Mr. T. J. Thomas, clerk, Council Offices, Bargoed.

SURVEYOR'S CLERK.—Codford, Wilts. 52s. 6d. per week, plus war bonus.—Division Officer, R.E., Codford, Wilts.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

NORWICH.—June 7th.—For repairs to 22 houses, for the corporation.—Mr. A. E. Collins, city engineer, Guildhall, Norwich.

Engineering: Iron and Steel.

NEWPORT (Mon.).—June 9th.—For the construction of a light railway, for the tramways department.—Mr. A. Nichols Moore, borough electrical and tramways engineer, Town Hall, Newport (Mon.).

HIPPERHOLME.—June 12th.—For laying 666 yards of 6-in. water pipes, and supplying 28 tons of 6-in. tested cast-iron water pipes and specials, for the urban district council.—Mr. G. Wharton Thompson, engineer and surveyor, Council Offices, Hipperholme.

Roads.

MONMOUTH.—June 4th.—For the supply of materials and for hauling broken and unbroken stone, for the county council.—Mr. S. A. Bennett, county surveyor, County Council Offices, Newport, Mon.

SOYLAND.—June 4th.—For the supply of about 1,000 tons of 2-in. broken granite, for the urban district council.—Mr. W. Whitehead, surveyor, Council Offices, Ripponden, near Halifax.

HOLYWOOD.—June 4th.—For the supply of 200 tons of 2-in. and 130 tons of 1½-in. road metal, and 100 tons of screenings, for the urban district council.—The Surveyor, Town Hall, Holywood, Ireland.

GREAT BERKHAMSTED.—June 6th.—For tar paving and incidental works, for the urban district council.—The Surveyor, 135, High-street, Berkhamsted.

LAMBETH.—June 6th.—For the supply of 100,000 3-in. by 9-in. creosoted deal paving blocks of varying depths, for the borough council.—Mr. Henry Edwards, borough engineer, Town Hall, Brixton-hill, S.W. 2.

GREAT BERKHAMSTED.—June 9th.—For the supply of flints, for the urban district council.—The Surveyor, 135, High-street, Berkhamsted.

CANNOCK.—June 29th.—For the reconstruction of the main road between Cannock and Hednesford, and other works in connection therewith, for the urban district council.—Mr. R. Blanchard, engineer and surveyor, Council Offices, Cannock.

Sanitary.

LANCHESTER.—June 4th.—For cleansing privies and ashpits, for the rural district council.—Mr. J. R. Lupton, surveyor, Council Offices, Lanchester.

HORSHAM.—June 4th.—For the construction of about 185 yards of 9-in. stoneware sewer, 58 yards of 9-in. cast-iron sewer, and small sewage filter and tanks, for the rural district council.—Mr. F. Fraser Haddock, clerk, Council Offices, 9, Carfax, Horsham.

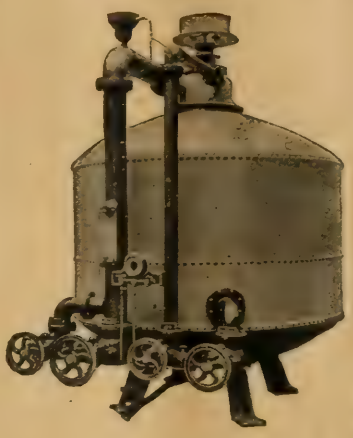
MALLING.—June 5th.—For work in connection with outfall works and flushing sewers at Snodland, for the rural district council.—Mr. C. Sowter, Myrtle Cottage, West Malling.

LEITH.—June 5th.—For the repair of sewers at Starbank-road and Trinity-crescent, for the town council.—The burgh surveyor, Charlotte-street, Leith.

WARRINGTON.—June 5th.—For the removal of the contents of pails and ashtubs, for the rural district council.—Mr. F. W. Kerfoot, inspector, Bewsey-chambers, Warrington.

Purification of Waters

WE are prepared to carry out schemes of water filtration and purification of any magnitude. For many years we have been engaged in the construction of Mechanical Filters and have installed numerous plants at home and abroad. Our Filters are extensively used by the War Office for the Water Supply of Camps and Munition Works. We shall be pleased to submit Estimates and Specifications for efficient plant to remove bacteria, suspended matter, iron, colour, and other impurities, and generally to render waters bright and sparkling for both town supplies and manufacturing purposes.



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EXMOUTH SEA DEFENCE WORKS. Expanded Steel-Concrete Slope and Roadway. Length 1 mile; total width of Roadway, 60 feet.
Mr. SAMUEL HUTTON, Urban District Council Engineer and Surveyor

THE EXPANDED METAL COMPANY, LIMITED
(Patentees and Manufacturers of Expanded Metal).
Head Office: YORK MANSION, YORK STREET, WESTMINSTER, LONDON, S.W.
Works: STRANTON WORKS, WEST HARTLEPOOL.

KIVETON PARK.—For work of public scavenging, for the rural district council.—The Sanitary Inspector, Council Offices, Kiveton Park, near Sheffield.

Stores.

MANCHESTER.—June 4th.—For the supply of stores, for the Gas Committee.—Mr. F. A. Price, superintendent, Gas Department, Town Hall, Manchester.

Miscellaneous.

LANCS.—June 9th.—For cleaning and repainting steel and ironwork in fifteen bridges, for the county council.—County Bridge-master, County Offices, Preston.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

NEW ROSS.—For the construction of sewerage works in Rosbercon for the urban district council:—

There was only one tender received, from H. C. McNally, 67 Holybank-road, Drumcondra, Dublin, which was not accepted, it being considered too high. Amount of tender £1,100.

WELLINGTON (SALOP).—For the supply of 50 tons of tar, suitable for painting, to Road Board's specification, for the urban district council.—Mr. Geo. Riley, engineer and surveyor, Wellington —

W. H. Keys, Limited, West Bromwich, 54s. per ton.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

1.—Town Planning Institute: Adjourned discussion on Mr. Rees Jeffreys' paper, "Road Construction and Improvements by Means of Town-Planning Schemes." The Surveyors' Institution, 12 Great George-street, Westminster. 6 p.m.

4.—Surveyors' Institution: Annual General Meeting. 5 p.m.

6.—Institution of Municipal Engineers: General Meeting in London, Mr. Reginald Brown, M.INST.C.E., on "House Refuse: Its Calorific Value and its Possibilities." 6.30 p.m.

7.—Society of Architects: Mr. R. Goulburn Lovell, A.R.I.B.A., on "Coal from Concreted Breeze, Sawdust and Ashes." 28 Bedford-square, W.C. 6.30 p.m.

21-22.—Incorporated Municipal Electrical Association: Annual Meeting. Institution of Civil Engineers, Great George-street, S.W.

22.—Institution of Water Engineers: Summer Meeting in London.

28-30.—Institution of Municipal and County Engineers: Annual Meeting at Hastings.

29.—Tramways and Light Railways Association: Annual Congress. Institution of Civil Engineers, Great George-street, Westminster. 2.30 p.m.

APPOINTMENTS OPEN.

URBAN DISTRICT OF OYSTERMOUTH.
APPOINTMENT OF SURVEYOR AND INSPECTOR OF NUISANCES.

The Oystermouth Urban District Council invite applications for the position of Surveyor and Inspector of Nuisances at a salary at the rate of £180 per annum.

The appointment is temporary and may be for the duration of the war or until the permanent officer's return from service, and may be determined by one month's notice.

Candidates must be ineligible for Military Service. The appointment, as to Inspector of Nuisances, will be subject to the approval of the Local Government Board.

Applications should be delivered to me not later than the 5th June, 1917.

JNO. H. ROBINSON,
Clerk to the Council.

Council Offices,
Oystermouth,
Near Swansea,
29th May, 1917. (3.419)

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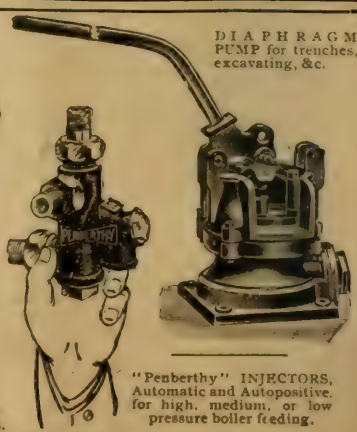

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The Surveyor

And Municipal and County Engineer.

Vol. LI. JUNE 8, 1917. No. 1,325.

Minutes of Proceedings.

Treatment of the London Water.

An excellent comment is made by Dr. Houston in his eleventh annual report to the Metropolitan Water Board. He very justly points out that papers of this kind impart knowledge, and that knowledge not infrequently leads to economy. There can be no doubt that Dr. Houston's reports are not only of the greatest value to the Metropolitan Water Board, but that other water authorities derive considerable advantage from them, and that they actually are the direct means of saving large sums of the public money. The fact that the estimated saving of coal over a comparatively short period—due to the adoption of chlorine sterilisation of the London water supply—is £11,167 is an example of the possibilities, but it must be remembered that there is here involved something much more than the mere saving of a large sum of money. Coal is a commodity of such enormous importance to a nation at war that, even if the cost of treatment had equalled the cost of the coal saved, this fact alone would have justified the action taken. The saving of material vital for war purposes, and the reduction of labour and of transport from the mine workings to the waterworks is something for which the whole nation is indebted to Dr. Houston, and its value at the present time cannot be overestimated.

The eleventh annual report deals with the sterilisation of the London waters and with the prevention of algal growths. It is becoming more and more evident that sterilisation by means of hypochlorite is a great success, leading to alterations in general waterworks procedure which will result, and which are resulting, in the saving of very large sums of money. Experience in the recent cold weather has brought forward a fact which ought to be very clearly grasped—namely, that when a water is entirely cold it may be practically impossible to effect sterilisation under from twenty-four to forty-eight hours unless a dose is used in excess of the minimum dose capable of producing a sterilising effect, and the shorter the contact the greater must be the excess. All evidence points to the great care required in giving the water its correct dose of available chlorine. This dose in the case of London has varied from 1 part per 1,000,000 to 4 parts per 1,000,000, the average dose being 2 parts per 1,000,000. It is shown that an attempt to reach consistently perfect results—that is to say, to kill all the B. coli—may lead to super dosing, unnecessary expense, and taste troubles, whereas if the aim is merely to improve the water bacteriologically to an indefinite degree the dose employed may be so small as not to give proportionately successful results, and may so be really wasteful. It is probably better to aim at the destruction of the great majority of the B. coli present as uniformly as possible, and by the exercise of greater attention to use the right amount of sterilising agent at all times, as this quantity must vary according to the quality and temperature of the water. The treatment of the water at Hampton has been uninterruptedly successful as regards taste, but in the case of the New River special difficulties were encountered, owing to inadequate storage and smaller filter capacity. In flood times during very cold weather it was found impossible to give the long contact or efficient filtration required, and the dose of chlorine had to be increased to such a degree that the taste of the water was objectionable. However, before sterilisation was considered there seemed to be no way of remedying the unsatisfactory state of affairs in times of flood except by the construction of costly works for adequate storage and filtration. It now seems possible to avoid, or to postpone, this expense by the judicious use of sterilising agents to mitigate the effects of flood. Such treatment would also largely inhibit the algal growths in their early stages.

Dr. Houston quotes a very interesting series of experiments which tend to show that it is extremely important to treat waters at a very early stage when there is evidence of the beginning of algal growth. By careful observation and quick decision it seems to be possible to *prevent* the growth of the various micro-organisms by treatment with hypochlorite or with copper sulphate. Experiments show conclusively, as judged by laboratory work, that it is quite practicable to inhibit algal growths with these substances. While it is clear that proper treatment can prevent a water going from bad to worse, and can, indeed, improve matters, it cannot within a reasonable time remove the trouble, hence the need of early treatment. The growth must be dealt with at its inception. It should be noted that, while hypochlorite and copper sulphate are both useful, it seems that weight for weight copper sulphate is the best algicidal agent. Hypochlorite is, however, superior as a bactericidal agent. It is therefore very desirable, seeing

that it is almost certain algal growths will begin to appear in the open reservoirs in the months of March and April, and also seeing that the best agents for preventing this growth are known, that such treatment should be applied, for, with the growth of algæ, there must be considerable pecuniary loss, owing to the rapid choking of filter beds. There is every evidence of the great saving which is to be obtained, not only in London but all over the country, by scientific control of water supplies, and the reports which are published by the Metropolitan Water Board form a most valuable basis for future work and for practical application of latter methods of water treatment.

* * *

House Refuse Disposal.

During the last thirty years or so considerable change has taken place in the general opinion with regard to methods of disposal of house refuse. At one time the tip—particularly if situated in an adjoining district—was considered to be an entirely satisfactory method to adopt, and it is only in recent years that the true sanitary value of incineration has been realised. While the principal object of burning refuse is to get rid of it in the interests of the public health, there has always been a natural feeling among engineers that the heat generated might be turned to some practical use. Hence attempts have been made, with more or less success, to combine refuse destructor installations with electric lighting undertakings, brick-making plant, or other means of utilising the energy generated in the process of burning. But we suppose it is still true that in the great majority of destructors no attempt is made to utilise the heat generated, or to apply it to any useful purpose. In these days of economy and avoidance of all waste, any suggestion for turning this waste heat to account is particularly welcome, and a paper on the subject which was read on Wednesday by Mr. Reginald Brown before the Institution of Municipal Engineers, and which will appear in our next issue, was naturally received with great interest. As is well known, Mr. Brown has devoted special attention to the question of the economical disposal of house refuse, and has patented a process by which this can be effected without nuisance by conversion into fuel briquettes. Mr. Brown estimates that the calorific value of ordinary house refuse is about one-fifth that of steam coal, and that by the simple process of drying this may be increased to one-fourth. There are, however, certain practical difficulties in converting this calorific value into useful work in the ordinary process of destruction. Chief among these difficulties are the necessity for subordinating heat utilisation to sanitary efficiency, and the varying quality and rate of delivery of the refuse. The chief merit which Mr. Brown claims for his patent process is that it enables the calorific value of the refuse to be conserved and utilised without endangering its sanitary disposal.

So far as it has been made public, Mr. Brown's process has already been described in these columns, but we may perhaps remind our readers that it consists essentially of the processes of crushing, briquetting, and impregnation. In the paper to which reference has been made, however, the matter is carried an important stage further, it being suggested that the finished briquettes should be used as a fuel for the conversion of sewage sludge into a dry manure. The inventor alleges that the chief reason why sewage sludge has not been more widely used as a fertiliser is the absence of a cheap and efficient means of drying it, and he claims that with fuel made from house refuse the problem is on the way to a solution. In all towns house refuse has to be disposed of, in almost every town there is also the sewage sludge to get rid of, so that the utilisation of the one will create a new value in the other. It is therefore suggested that every town has now at hand a ready means not only of disposing of the house refuse on very economical lines, but also of utilising the converted refuse for drying the sludge produced at the sewage works, thereby producing, at a big saving to the ratepayers, a decent fertiliser.

* * *

Municipal Engineers and Town Planning.

From the very inception of the town planning movement in this country we have consistently agreed that the qualifications and experience of municipal engineers are such as to fit them specially to undertake the work of town planning in their own districts, with the advice or assistance of architectural and other experts where necessary. It is therefore with some interest that we observe in a recent issue of our American contemporary *Engineering News-Record*, an article by Mr. Thomas Adams, the town planning adviser to the Canadian Commission of Conservation, Ottawa, the opening sentence of which states that "the progress of city planning schemes on this continent depends on municipal engineers more than on any other body of men." Mr. Adams fully realises the need for collaboration in town planning. Indeed, he specifically states that the engineer, the architect, and the landscape architect must act together. But it is the municipal engineer with his official standing who should be responsible for bringing about the scheme of co-ordination. This is precisely what we have been saying for some years past with regard to town planning in this country, and it is encouraging to find our American contemporary echoing the same strain. While speaking of Mr. Adams' article, we may perhaps refer to some remarks which he makes incidentally on the general question of the status of municipal engineers. He points out, for example, that "until more confidence is shown in the men who have to administer the complex engineering problems of the modern city, cities will not get men worthy of confidence." And, again, "As the position of the municipal engineer becomes strengthened his vision will become broader." These epigrams go to the root of the question of status, and express in a nutshell the aim which British municipal engineers have in view.

* * *

The Ministry of Health.

In receiving a deputation from the British Medical Association recently on another question, the President of the Local Government Board took the opportunity of alluding at some length to the suggested establishment of a Ministry of Health, and requested the association to take into consideration this larger topic. As a result of this request a committee, which included a number of medical officers of health, was formed at the instance of the association, and a scheme for the organisation of the Ministry has now been produced and forwarded to Lord Rhondda. As regards central organisation, the association approves of the proposal that a Ministry of Health should be created to take over from existing Government Departments such duties as are concerned with the health of the community and to deal with those duties only; and, further, that the administrative functions of the Ministry should be carried out by a board, presided over by a Minister of Cabinet rank. As regards local organisation, it is suggested that the country should be divided into suitable administrative areas, and that these areas should be such existing local government areas or combinations thereof as will require the services of whole-time administrative medical officers, both

clinical and preventive. For each area a local Administrative Health Committee would be set up, consisting of representatives (*a*) of the rating authorities; (*b*) of the education authorities; (*c*) of the persons contributing to a scheme of health insurance (including in this employers of labour); (*d*) the medical profession; (*e*) public hospitals; (*f*) dentists; (*g*) pharmacists; and (*h*) nurses. All the indications point to the proposed new Ministry being a matter of very practical politics, and the medical profession are fully alive to their very close interest in the questions involved. Indeed, the scheme referred to is prefaced by some observations, in the course of which it is frankly stated "that the association should take a strong position in attempting to mould the proposals in such a way as will accord with what are believed to be the best interests of the public and of the medical profession, which, as the representative body has long since recognised, are in the long run identical." It behoves existing municipal officers, who may be affected by the scheme, to watch its progress very carefully with a view to safeguarding their own legitimate interests.

* * *

Empire's Mineral Resources. The first step towards giving concrete expression to the resolutions of the recent Imperial War Conference has been taken by the appointment of an inter-departmental committee to prepare a scheme for the establishment in London of an Imperial Mineral Resources Bureau. The appointment of the committee, which is representative of the Home Country, India, and the Dominions, is the direct result of a decision of the War Cabinet upon a resolution adopted by the Imperial War Conference. Its establishment is of the first importance for the future development of our resources. Its first duty will be to collect information in regard to the mineral resources and metal requirements of the Empire, and upon this information it will advise what action, if any, may appear desirable to enable such resources to be developed and made available to meet requirements. Sir James Stevenson, the Director-General of Explosives Supply, will act as chairman.

* * *

Timber Haulage and the Roads. The letter from Mr. J. D. Haworth, the acting secretary to the Roads Improvement Association, which will be found in another column, raises a question of very great importance to those rural highway authorities whose roads are being used for the haulage of heavy loads of timber intended for Government use. Traffic of the kind indicated would, if conducted by a private individual or firm, undoubtedly be "extraordinary traffic," and the expense of making good any damage caused by it to the roads would be recoverable from the party responsible. In these circumstances it might have been expected that the Government would have shown a proper disposition to meet the local authorities concerned with regard to the payment of compensation; but this does not appear to have been done. The result is that many rural authorities whose districts are of low rateable value find themselves saddled with a heavy liability for reinstating roads which have been damaged by Government traffic, thus inflicting considerable hardship on the already over-burdened ratepayers. Mr. Haworth, in his letter, suggests that the local authorities concerned should take joint action with a view to securing a conference with the Government Department directly responsible for the supply of timber, so as to settle definitely the obligation to compensate and the basis upon which compensation should be assessed. If this course be adopted it ought to be possible to end the present unsatisfactory state of affairs and to come to an arrangement which is just and fair to all parties.

* * *

A Shortage of Plumbers. At a recent meeting of the Wrexham Town Council attention was called to the serious situation that has arisen in the town owing to the large number of houses which are without a proper supply of water, and to which such a supply cannot be furnished, owing to the absence of so many plumbers on military service or munition work. It appears, indeed, that at Wrexham it is practically impossible to get any sanitary defects remedied if the repairs required need the assistance of a qualified plumber for their execution. Such a state of affairs involves grave danger to the public health, and the representations which are being made to the authorities by the council are, in our view, entirely justified. It has wisely been decided to base these representations upon accurate information to be obtained from the master plumbers in the town as to works required in the interests of the public health, which they are unable to carry out in the near future on account of the dearth of plumbers. Having obtained this information, the proper authorities will be approached with a view to the temporary release from the Army of a number of plumbers to do the work. Probably Wrexham is by no means the only town which is affected in the manner indicated, and if other places would take similar action it might be borne in upon the authorities that a larger proportion of men skilled in sanitary repairs should be retained for civil work, in order to safeguard the health of the people.

* * *

Bradford Parks Committee and the Allotments. The new departure in the cultivation of allotments is certain to have important social and economic results to the nation, and most of us are sanguine that it will give a permanent impulse to the increased production of fruit and vegetables. Needless to say, it is a movement that receives the encouragement of every patriotic Briton. Morally it is established upon the soundest of bases, for we have always in this country accepted, though we have somewhat haltingly followed, the axiom of Swift that the man who grows two blades of grass where only one was grown before is a benefactor to his kind. It is to be noted with satisfaction in this connection that the Parks Committee of the Bradford Town Council have come to the praiseworthy decision to prepare an official record of the local food production scheme. They have sent round to the allotment holders a circular asking them to make a return of all expenditure incurred upon the plots cultivated during the present year, together with particulars of the crops obtained. It is to be hoped that the committee will receive a general response to their request, for such a return is certain to prove not only interesting, but extremely useful to allotment holders in Bradford and elsewhere. Other municipal authorities might well follow this excellent example, and thus supply what would doubtless prove to be a valuable record of the economics of war-time productivity.

Dealing with the Fly Nuisance in Glasgow.—Mr. Peter Fyfe, chief sanitary inspector of Glasgow, has been authorised to deal with the fly nuisance during the ensuing months. The efforts made last year proved very successful, and during this summer the work will be on similar lines. The city has been divided into six districts, one to be visited each day of the week, so that stable owners will know when the manure pits connected with their premises will be disinfected. Mr. Fyfe asks for the co-operation of contractors and others in order that the work may be done systematically and efficiently.

Progress of Town Planning in Scotland.*

By W. REES JEFFREYS.

The local government system of Scotland differs in many respects from that of England and Wales. It is important to keep these differences in mind when studying any particular public service carried out by local authorities. The following are material to the consideration of the operation of the Town Planning Act in Scotland:—

(1) There are no rural district councils in Scotland. Most of the functions that district councils discharge in England, particularly those relating to roads, are discharged in Scotland by the county councils or district committees of the county councils.

(2) There are no "main" roads in Scotland charged on the county rate as distinguished from district roads charged on the district rates. All roads outside the burghs are maintained by the district committees, and are charged on the district rates—*i.e.*, throughout Scotland the rating area for important and minor roads is the same. (Rates in Scotland are divided between owner and occupier.)

(3) All the Scottish burghs (and in Scotland some very small aggregations of populations are burghs) are divorced from the county, both for administrative and rating purposes. Every little town in Scotland is practically, therefore, in the same position as a county borough in England.

The Scottish system has its advantages and disadvantages. It is an advantage that all the roads in any given rural area are in the hands of one authority. It is a disadvantage that the burghs are cut off from the county and do not contribute towards the costs of the roads which they use outside their area. In other words, the position is in Scotland what it would be in England if, in addition to the county boroughs, all the non-county boroughs and urban districts were withdrawn from the administrative county for rating purposes. This condition adds to the difficulty of town planning, including housing reform and road construction and improvements in Scotland.

In the application of the Town Planning Act to Scotland the county councils (through their district committees) are necessarily town planning authorities. The difficulty which obtains in England and to which reference is made in the paper—namely, that county councils, as the principal main road authorities, are not permitted to exercise town planning powers—does not obtain in Scotland.

From the date of the passing of the Act in 1909 up to the time of writing (May 1, 1917—a period of nearly eight years), no town planning scheme has been approved by the Local Government Board for Scotland.†

The following authorities have, however, deposited schemes with the Local Government Board for approval:—

Dunfermline.
Edinburgh (Fountain Bridge).
Kirkcaldy.

Authority has been granted by the board to the following authorities to prepare schemes:—

Ayr.
Buckhaven, Methil, and Innerleven.
Dundee (three schemes).
Edinburgh City (three schemes).
Lanarkshire County (two schemes).
Fife County (four schemes).
Inverkeithing.
Lanarkshire County, Middle Ward District (two schemes).

In addition, ten authorities have made application for authority to prepare schemes, or have intimated their intention to do so.

An Arterial Road Scheme.

From the point of view of arterial roads, the most interesting of the Scottish schemes is the one that provides for the construction of a new road from Glasgow to Dumbarton. It has been the subject of considerable discussion and negotiation, but it has not yet taken practical shape. The principal cause of delay is that more than one authority is concerned, and in Scotland, no less than in England, it is difficult to get adjoining authorities to work together. The authorities concerned are the Glasgow and Clydebank Town Councils and the Dumbarton and Renfrew County Councils. Dumbarton and Renfrew are not different from other counties in viewing with suspicion the extension of the power and authority of the large city which adjoins their borders. On the other hand, the county has not the financial resources to undertake road construction on the scale which the new scheme involves.

Those who are familiar with Glasgow are aware that Glasgow and Dumbarton at present are connected by a road 15 miles long, which, after leaving Glasgow, passes into the county of Renfrew, then through the burgh of Clydebank, into the county of Dumbarton. The existing road in the urban area is 60 ft. wide with a 40-ft. carriageway (though in places it is less) and supports a double line of trams. It is alleged that it does not serve local requirements, and the cost of widening it would run into millions of pounds.

It is proposed to construct an alternative road about eight miles in length and 140 ft. in width, and incidentally develop the country further north for housing and industrial purposes. The proposed new road continues the Great Western-road, Glasgow (a fine avenue which, like Cromwell-road in London, comes to an abrupt end at Anniesland-cross). The new road for a distance of 1,353 yards is in the city of Glasgow, and for the remaining 12,666 yards in the county of Dumbarton, where it would rejoin the existing main road at Bowling—about 3½ miles short of the town of Dumbarton.

The cost of the road as a special undertaking would probably not be less than £300,000, or about £37,500 per mile. Its cost as a road laid down under the Town Planning Act and gradually constructed as the ground became ripe for building, I am unable to estimate, as I am equally unable to forecast the time that would elapse when the completion of the last section would render it useful as a through route from Glasgow to Dumbarton.

Glasgow is seeking powers to town plan part of the area in Renfrewshire and Dumbartonshire. Clydebank also seeks authority to prepare a scheme for an area in Dumbartonshire. The counties have opposed. At the inquiry held by Mr. J. Walker Smith for the Local Government Board, the county's representative said, "We are the local authority and we will town plan our own area."

Glasgow's application is now before the Scottish Local Government Board for decision, and in the meantime conferences are being held with a view to the constitution of a joint committee of the local authorities concerned.

A Commission on Powers and Boundaries of Local Authorities.

The question at issue here is the one discussed in the body of my paper. What is the unit of sound and economical administration? I venture to think that in Scotland, as in England, it will be found to differ according to the district and to the service. It is not wise for an Englishman, however long and sympathetically he may have studied Scottish conditions, to dogmatise, but it is probable that the need for a special commission of experts in Scottish local government to study varying local conditions and propose suitable schemes to meet them is as urgent in Scotland as a corresponding Commission is urgent in England. Such a commission would be able to take the initiative, and, after due inquiry and negotiations with all the interests concerned, propose to the Local Government Board for Scotland such alterations and adjustments in the duties, powers, and areas of particular local authorities as special conditions and changing circumstances appear to require. Such proposals, including the necessary financial adjustments, if approved by the board, with or without alterations, might then be embodied in a provisional order and, subject to the usual formalities, become law. It is certain that authorities generally will not combine on their own initiative, and it is doubtful whether joint committees will prove the final remedy.

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* Extracts of paper entitled "Road Construction and Improvements by Means of Town-planning Schemes," read before the Town Planning Institute. See THE SURVEYOR, April 27th last.

† I understand that for the past two years the entire energies of the Local Government Board staff which deals with housing matters has been devoted to assisting to procure housing accommodation for war workers.

THE TRIBUNALS.

At the Rhyl Tribunal the health inspector, Mr. Lowe, appealed for the exemption of a man twenty-nine years of age, married, Class A. He stated that the man was absolutely essential for the health of the town, having charge of the whole of the flushing tanks and disinfecting apparatus. He had been trained for eleven years, and was the only competent man left on the staff, all the others having joined up. The military representative urged that someone else might be taught the work. Mr. Lowe replied that a man could not be taught the whole of the sewer connections, flushing system, and high-pressure boiler work in a few weeks. The tribunal decided not to release the man until an efficient substitute to their satisfaction was found.

At the Eastbourne Tribunal on Wednesday the military asked for the review of the conditional exemption certificate granted to the deputy borough surveyor, 39, married, passed for general service. It was contended that there was another man in the department who had been rejected who was competent to carry on the work. On behalf of the corporation it was pointed out that the man was in charge in the absence of the borough surveyor on war service, and had some 200 men under his charge. At the same time he was quite willing to go, and had, in fact, volunteered some weeks ago for the Road Construction Corps. The tribunal withdrew the certificate, and granted eight weeks' exemption, no further appeal to be made without leave.

COAL CONCRETED FROM ASHES OR DUST.*

By R. GOULBURN LOVELL, A.R.I.B.A.

It can be assumed that the supply of fuel to-day is as important as the supply of bread. Yet millions of gallons of petrol and tons of valuable chemicals are wasted every year under our present system. One of the most important questions in national reconstruction will be a better and saner use of fuel. The subject is now being investigated, and remarkable developments may be expected in the direction of the utilisation of power and heating and the utilisation of by-products.

In co-operation with my friend Mr. C. M. Hughes, we have evolved a process which will enable a fuel to be made without pressure at any industrial locality from the waste products to be found in that locality which may possess any calorific value. This process is a humble but very important part of a great scheme for the proper utilisation of fuel. It provides for immediate necessities and utilises a residual product now of comparatively small value.

The main problem before us is:—(*a*) The utilisation of the waste products of any calorific value. (*b*) The production by unskilled labour and existing machinery. (*c*) The saving of transport.

If a method of production could be found by which an aggregate of breeze could be concreted by such matrices as lime, pitch or glucose, the main problem would be nearly solved. Every architect or engineer will recognise the possibility of concreting by the addition of lime, chalk, or other calcium carbonate. They will also recognise the need of carefully apportioning the various aggregates to avoid too dense a substance on the one hand, or too open and friable a substance on the other.

In producing a satisfactory fuel, the main objects aimed at would be non-friability, good flare, non-caking, good coking, good incandescence and non-clinkering, otherwise a free combustion with good calorific value at a low price.

When one considers Nature's varying methods of producing coal, it will not be difficult to understand that man must not expect to produce it on any one uniform plan. The characteristics of the varying aggregates and of the varying matrices require that the waste products of each locality should be carefully studied before determining upon the most satisfactory method. Further, the use to which the fuel has to be put must be considered; that is, if it be required for open grates or closed stoves, or if a high calorific value or a bright burning coal be the chief desideratum. It has been ascertained, however, that from these varying conditions certain relative proportions can be determined of a more or less uniform character, and this has been systematically done.

A coal is here shown which has been concreted from coal dust alone, another from coke dust alone, another from destructor ash alone, another from destructor ash and coal dust, and another from clinker, bar ash and sawdust. In the fire the better grades burn like Nature's coal, the lower grades like coke; they all flare, coke and incandesce. Further, these artificial coals will be found to be more lasting, in the same way as a good artificial stone is more lasting than most stones made by Nature.

The machinery and plant required practically exists in all industrial centres. The essentials are crushers or breakers, screens, driving tables, mixers and moulds such as cast away pails, baths, &c. For the cooking process either ovens or boilers can be used, the main object at the present time being to utilise any existing plant with unskilled labour.

COST.

The cost depends mainly upon the value put upon the bases, the cost of the matrices, such as glucose, pitch and other bitumens, and the cost of the chalk or other calcium carbonates. For instance, the destructor ash and clinker at Eastbourne is valued at 6d. a ton, whereas at Birmingham an allowance is made of 2s. 6d. a ton. The coke breeze in London is valued at 6s. a ton, and in Birmingham at 1s. The price of hard pitch is quoted 38s. a ton at Eastbourne, 22s at London, and 18s. at Birmingham. On the other hand, the price of chalk is 3s. 6d. a ton at Eastbourne, 6s. at London, and 16s. at Birmingham.

Speaking generally, the cost of the materials of these seven typical examples would be, roughly:—

CALORIFIC VALUES. B.T.U.'s.	SAMPLES.	PER TON.
7,500.	No. 1, Eastbourne destructor ash...	11.0
8,040.	No. 2, Maples destructor and coal dust	4.6
10,320.	No. 3, Maples destructor and sawdust	9.0
10,540.	No. 4, Birmingham destructor and coal dust ...	8.0
11,840.	No. 5, Birmingham coke dust	7.0
12,600.	No. 6, London coke dust	10.0
12,820.	No. 7, Staffordshire coal dust	10.0

The cost of the labour and establishment charges in the British Isles would not be more than 5s. a ton.

The calorific value of each sample is shown in the left column.

This schedule makes the following facts evident:—

1. That the millions of tons of coal-slack can be concreted, without pressure, into an excellent coal.
2. That all the powderous brown coals can also be concreted into a good transportable coal.
3. That all the coke dust accumulating in the gas-works can be similarly utilised.
4. That an excellent fuel can be produced from sawdust in all the timber countries of the world
5. That the household ashes and the municipal destructor can be made into cheap flaring coke.
6. That all industrial concerns consuming more than ten tons of coal a day can reduce their bill by at least one-third, and also use of their accumulating waste products.
7. That this work can be done by existing machinery and unskilled labour.

I therefore invite your consideration as to whether our main problem is not solved. I submit that these various aggregates or *débris* can be concreted into fuel by man in twenty minutes, or if you like in twenty days; while Nature's better but longer process has occupied twenty million years!

When it is remembered that over fifty million tons of coal were exported last year from the British Isles, the national and international importance of this process of making a good fuel will be at once seen.

Upon the receipt of samples of any waste products of calorific value from any centre, tests can be made to determine the most satisfactory formula, and a licence to manufacture can be granted with one dominant restriction—namely, that the fuel should be supplied to the consumer at a profit of not more than 25 per cent.

* From a paper read yesterday at a meeting of the Society of Architects.

Road Upkeep: Omnibus Companies' Contributions.—Maidstone Town Council have asked the Kent County Council to negotiate with the omnibus proprietors for the following scale of payments on new routes: 1d. per 'bus-mile on water-bound macadam roads, ¾d. per mile on tar-macadam or other bituminously bound surfaces; ½d. per 'bus-mile on roads having concrete foundations, with a minimum of £10 per route-mile per annum from each proprietor.

Road Construction and Improvements by Means of Town Planning Schemes.

VIEWS OF MUNICIPAL AND COUNTY ENGINEERS.

On Friday last the discussion of the paper on the above-named subject which Mr. W. Rees Jeffreys, secretary to the Road Board, read on April 20th last before the Town Planning Institute was resumed. The paper of which an exhaustive summary appeared in our issue of April 27th, virtually consisted of an inquiry into the possibility of building and improving roads of more than local importance by using the powers given to local authorities by the Town Planning Act. In the first part of his paper Mr. Jeffreys dealt at some length with the legal position in regard to the matter with reference to the specific provisions of the Act. In the second part an examination was made of the five town-planning schemes that have been approved up to the present time, with special reference to the financial obligations as regards roads imposed by them on local authorities. The investigation showed that it was impossible to determine precise results, but that the machinery of the Town Planning Act enables roads to be constructed or widened at a less cost to the local authorities than by any other procedure. Mr. Jeffreys next discussed the question of co-operation and the provision of the cost of special works, such as bridges, &c., testing the possibility of such co-operation by reference to a number of hypothetical cases. In the final part of his paper Mr. Jeffreys discussed three main difficulties which he sees in the way of carrying into effect the proposal to utilise the powers given by the Town Planning Act for the purpose of arterial road construction and improvement. First, it was suggested that there was no inducement for men with the necessary qualifications to initiate and carry out such schemes, and that there was no available organisation for training and employing such men. The remedy proposed by the author was the formation of an official or semi-official department attached to the Local Government Board for the training and employment of practical town-planners, who would be available for employment by local authorities. The second of the difficulties which Mr. Jeffreys discussed was that of finance, and particularly the financial obligations that would be cast upon local authorities in providing the cost of special works, and the cost of road construction in advance of building development. The third and last of the difficulties discussed was that arising from the divided interests of adjoining authorities. It was proposed to meet this by the establishment of a permanent commission, whose duty would be, after due inquiry and negotiation with all the interests concerned, to propose to the Local Government Board such alterations and adjustments in the duties, powers, and areas of particular local authorities as special local conditions and changing circumstances might require. The central proposal of Mr. Jeffreys' paper, however, was for the establishment of a town planning commission, with power to initiate schemes, and, when necessary, to execute them; and with sufficient funds to give assistance where assistance was required.

The views of municipal and county engineers and others with regard to the proposals expressed, either in written communications to the author of the paper or in the course of the discussion of the contribution, are set out below:

Mr. John S. Brodie,

Borough Engineer of Blackpool:

My own experience has been that new arterial roads carried out partly at the cost of the abutting owners of the land and partly at the cost of the local authority under private Acts of Parliament, have been constructed both well and economically. The suggestions for prepared schemes, defining main roads, building lines, and rental values of property to be created, I have found to work satisfactorily in practice. I do not, however, share the disappointment of the author as to the slow rate of progress of town planning schemes, as I think this is a case where we must make real progress slowly but surely. My own feeling is that if an expert central staff of town planners is set up there will be several objections raised. (a) It will be urged that such a central staff cannot have the necessary local knowledge of the land. (b) That such a central staff will surely become stereotyped and inert in its methods. (c) That the sacred English principle of self-government, or government by consent of the governed, will be seriously and injuriously affected. (d) That local authorities, who bear the expense, must have a decisive voice in controlling the expenditures. On the other side there would be certain counteracting advantages, such as: (e) In the case of an unwilling or obstructive local authority, a central authority, in the shape of a commission attached to the Local Government Board, would, I think, be the only feasible method to carry out what has been called "compulsory town planning." (f) In the case of small local authorities, unable to provide competent staffs, there would be a reasonable prospect of a satisfactory work being done by a central staff, as suggested. I agree with the author that housing and town planning go together, and should always be considered together, as without housing there can be little need for town planning, and we have seen by past experience what housing without town planning leads to. As regards finance, I am clearly of opinion that the cost of arterial roads will in future be borne in ascertained proportions by: (g) The owner of the land or property abutting by contributions in land or money, or both; (h) The local authority; and in the case of main "backbone" roads through several districts; (i) By grants from Imperial funds, in addition to the contributions from the private owner and the local authority.

Mr. J. Walker Smith,

Chief Engineering Inspector, Local Government Board for Scotland:

In dealing with the provision of suitable new roads through the areas of different local authorities, you have chosen a most difficult problem. At the same time, the provision of such roads under such circumstances forms, perhaps, one of the most desirable operations which it is possible to deal with under the provisions of the Town Planning Act. I feel satisfied myself that this important question can be dealt with efficiently under town planning schemes, but if the provision of suitable new roads cannot be so made, I am afraid that there is no probability of the immediate future bringing other machinery into existence. I will now offer a few brief observations upon the peculiar difficulties in prescribing common features, such as a proposed main road intended to pass through the administrative areas of various local authorities. There may be serious conflicting views. The only solution of the difficulty, the only satisfactory course, is to bring the neighbouring local authorities together and get them to co-operate whole-heartedly. A joint committee should be set up consisting of representatives of the districts concerned—not necessarily in equal numerical strength—to discuss the question as a whole. Get them to agree to give the proposed joint procedure a trial, and you will already have gone a long way towards success. Having obtained general approval of the objects to be sought, and having made clear the presently non-committal character of the proposals, the central authority should then draw up for their consideration a suggested scheme of procedure. This should settle the representation of each local authority; it should provide for the expenditure incurred by them being borne in proportion to their representation; it should stipulate for as much local work as possible being done by the staffs of each local authority; it should require the establishment by the joint committee of a central town planning staff to work out in co-operation with the technical staffs of the various local authorities a complete scheme for the whole area. The local authorities concerned, having agreed upon a general constitution and programme, should proceed with the preparation of the scheme, under the following safeguards in case of failure to agree, viz.:—(a) No authority to town plan would meantime be given to any of the local authorities in respect of any part of the common area—lower valley in the case assumed—to be considered by the joint committee. (b) The position of the local authorities concerned should not be prejudiced by their repre-

sentation upon the joint committee and by their co-operation in the preparation of a scheme. They would then proceed as a committee, with a clerk and technical advisers, to deal with the area as an *unum quid*. At the same time they would proceed with their work with the full knowledge that if it should not succeed their participation therein will not have prejudiced their position. I am quite sure this joint committee as adumbrated would, when constituted as a town planning committee, be a town planning committee in the fullest sense of the term, and would shake themselves free from local prejudices, and that their work would benefit from a free exchange of views formed from different standpoints. Such a committee would consider in the early stages of the work the provision of through road accommodation, which is of such interest to yourself. They would fix upon a suitable route and define an adequate width. They would make provision for high-speed tramways. Local men will use their local influence to explain to the landowners the effect of the construction of such a road. They will secure co-operation of the landowners by discussing the matter with them, and showing the benefits which the landowners will derive, not only directly in ripening their land for development, but also by means of suitable provision which the construction of this main road would enable the committee to insert in the scheme to prescribe for light and narrow roads in the hinterland of the proprietor's estate. Upon their making such adjustments as these with the landowners they should be able to obtain the requisite land for the street works without payment. The landowners will also most probably accept the obligation as they should if it can be shown to be to their advantage to do so—to pay for road-making expenses, not for the full width of 140 feet, but for so much as would need to have been made by them if the road had been constructed under the existing by-laws and regulations. The committee would discuss the whole question with the tramway authority, who would not be slow to see the advantage which would accrue from the provision of a special track from the points of view of first cost of construction, maintenance and high speed. They will appreciate that such advantages are well worth paying for, and it is not extravagant to expect that the tramways authority would at least bear the cost of providing the street work for this special track. One must form one's own judgment of the probability of obtaining some measure of Government assistance in provision of these main arteries, which are of more than local interest. Such roads could never to be constructed solely at the national expense, or much of the incentive to economy would disappear. If, however, the initial cost were reduced to the minimum and a special rate levied for subsequent widening and construction, and if the tramway track portion were provided for by the tramway's authority, then the burden eased by a State subsidy—spread over the areas of the local authorities affected, would be easily borne, and would become a most profitable investment. In such a case it is possible that the joint committee under whose guidance and control the scheme was prepared would become a "joint body" under Section 55 (3) of the Housing and Town Planning Act, 1909, for such special purposes as the main road; for the remainder the responsible authorities for enforcing the observance of the scheme might be each local authority for its own district. Thus there would arise the least possible friction and the least dislocation of existing powers and duties in local affairs, whilst the regional purposes would be dealt with by a representative regional body.

Mr. T. NISBET,
Master of Works, Glasgow:

The question of the essential contents of a town planning scheme has recently been brought before the Scottish Law Officers of the Crown, and their opinion, in a letter from the board to Mr. Whyte, secretary of the Scottish National Housing and Town Planning Committee, indicates that town planning schemes may be prepared showing little more than the lines of through main roads.

Mr. A. HORSBURGH CAMPBELL,
City Engineer, Edinburgh:

Dealing with the leading impressions I have formed of the paper, let me say (1) That town planning is not so dominated by road-consideration as the author has endeavoured to show. It is true that throughout this paper he sprinkles thoughts of those other things that vitally matter in the sphere and scope of town planning, but his treatment of town planning as it appears to-day, and as he would reform it to-morrow, is controlled and dominated too much by the incidence of highway development. And this note of the subordination of town planning to the widening and improvement of roads runs through the paper, and by its obsession leads to conclusions that are, in my judgment, impracticable, unrealisable by legislation; and even were they realisable they would miss their aim in execution, and the last state would be worse than the first. Further experience and argument may modify the view I now state; but, without dogmatism, I respectfully submit that town planning is not merely road-planning, even although this limitation may or may not be legally possible. I note that the Local Government Board rather conveys the impression of tentative schemes of an incomplete kind; but liberal though this concession is when considered as an official utterance of the central authority, it will be observed that the tentative scheme, as suggested by the Local Government Board, goes much further than the laying down of lines of arterial roads. It includes, for instance, other cardinal matters which cannot be left out in any scheme of even a preliminary or skeleton kind. I agree with the author that town planning may probably enable new road formation or widening to be carried out at reduced cost; but the minimum of cost can only be achieved when we accompany road construction and widening by all the advantages which a real and not a skeleton scheme of town planning can confer upon the neighbourhood. Much of the author's difficulties in the successful application of the Town Planning Act are due to the incomplete and *ex parte* use he seeks to make of this Act. He finds the other (highway) weapons provided for him by the Legislature apparently too blunt or too costly for use; and so he seeks to appropriate to the purpose that lies nearest to his heart (viz., highways) another weapon which, if less costly to him, yet needs fashioning and tempering to adapt it to his purpose. That, I respectfully submit, is not fair to the cause of town planning; and it brings the author into sharp conflict with the practice of town planning. The progress under the Act has not been what it might, but do not ascribe it to wrong causes. From constant and active pursuit of town planning work, let me ascribe it to its proper causes. These are, briefly stated: (1) The unnecessarily complex regulations of the Local Government Board. (2) The needless procedure required before getting leave to prepare a scheme for an area. (3) The slow progress of Government Departments in dealing with and disposing of schemes. (4) The jealousies of neighbouring authorities in the promotion of rival schemes. Practical town planners and the societies that unite them in England and in Scotland are moving towards the removal of the aforesaid bars to progress, but their experience has not taught them that the defects of the past are attributable to that which the author improperly ascribes. The creation of a town planning commission will not be a remedy; it will be another board called into being to further complicate the already complicated network of local governing authorities throughout the country. Use the legislation we already have, shear it of its red-tape administration; let each State Department of roads and of town planning do its own business, and use each its own statutory powers, co-operating as and when desired; let every one in his due place and authority make his contribution to the common stock of town planning, and then progress will be registered worthy of the nation and of the cause of good, efficient local government, and well-ordered city development.

Mr. A. DRYLAND,
County Surveyor, Surrey:

To my mind, the necessity of good arterial roads will be so great in the near future that the money will have to be found; moreover, I am not at all daunted by the amount. If I am right there should be no real difficulty in getting legislation: (1) To sterilise the land for a time to make the arterial roads possible. (2) Setting up a body with adequate powers to lay out and construct the roads. (3) Providing that body with the necessary funds. Sterilisation of the land is, I consider, urgent, as rapid building after the war may block certain routes which are now practically open. It appears to me also that some one body of commissioners must be entrusted with the task. I think it is pretty hopeless to expect the roads to be secured by the existing numerous bodies at present entrusted with town planning powers. I do not see why the Road Board should not become that body, or rather why they should not act up to the powers they

have in the matter, and if their powers and the funds at their disposal are not sufficient let them ask for more. It must be remembered that it is no part of the duty of local authorities to construct new roads, and localities, except as part of a large area benefited, should not, in my opinion, be expected to pay any part of the cost. I think it would be extremely useful if county councils had powers to town plan in regard to main roads, as they could have regard to the probable future requirements of a road throughout their area. They certainly should have power to define a building line.

Mr. J. S. Killick,
County Surveyor of Hertfordshire:

There can be no question that it would be advisable for county councils to have powers to town-plan—the county council of any county must be in a better position to know the requirements of their administrative area as a whole far better than, say, a comparatively small urban or rural area within the county. Small local interests are often seen through jaundiced eyes, and, in my humble judgment, county councils should be the senior town planning authority within their county, and should work in conjunction with other authorities within their area. Should a central authority be set up to assist and encourage town planning authorities in order that the Housing and Town Planning Act may recover from the bad attack of rickets from which it is suffering? The answer, to my mind, is "Yes," and I think the suggestion that the department of the Local Government Board now dealing with this subject should be extended, and its personnel increased with a view to greater assistance, is a good one. I would go further than this, and say the many questions relating to land purchase, betterment, worsement, &c., could be dealt with by the various officials of the Land Valuation Department working in conjunction with the officials of the local authority. The special work for which the Land Valuation Department was created is nearing completion, and I believe the question of finding other work for it is engaging the attention of the Government. If my suggestion could be adopted, that department has not only much of the information required, but its personnel has the necessary qualifications for carrying it out. It is known to all having knowledge of local government how difficult it is for a surveyor to a local authority to obtain permission for a special assistant in order to assist him in town planning work. If the junior officials of the Land Valuation Department could be trained in town planning and lent to local authorities as and when required, for a small fee, to assist them in the preparation of their schemes, probably the action of councils would be stimulated. The knowledge that the official so employed would not be a permanent one would certainly be of considerable importance to local authorities. With regard to the town planning of arterial roads, the classification of the roads of England, as commenced by the Road Board at the instance of the Local Government Board, but which was postponed owing to the outbreak of war, should be of great assistance when this question is being considered.

Mr. A. E. Brookes,
County Surveyor of Durham:

In my humble opinion, the object in view—that is, to lay down arterial roads and to widen and improve existing ones at the expense, to the greater part, of the landowners or frontagers who reap the advantage of the betterment of their property—would be better attained by additional powers conferred by Parliament on highway authorities, particularly county councils. Legislation in this direction should commence with a consolidation of the existing Highway and Bridge Acts of the Realm, removing many of the existing anomalies which unnecessarily restrict the powers of highway authorities and permit private enterprise, although it may be for a public service, to expose and render less convenient and commodious the roads of the country. It should further provide for conferring powers on county councils to propose schemes within, or without, their respective counties, for new arterial or the improvement of existing arterial roads on the lines of the powers conferred by the Housing and Town Planning Act, more particularly as to acquiring land, recovering "betterment," &c., and also giving powers to prescribe building lines, fix minimum width of roads, and determine and approve the lines, limits, and direction of new roads or streets proposed to be constructed by private enterprise. In the case of new roads proposed and approved, an essential part of which is outside the area of the proposing authority, the outside authority should become liable to proportionally contribute to the cost of the work.

Mr. W. G. Bryning,
County Surveyor, North Riding of Yorks:

If the further powers suggested by Mr. Rees Jeffreys can be obtained, the Town Planning Act would be a valuable method by which highway authorities could secure the construction of "arterial" or through roads, which will undoubtedly be needed after the present war. A commission such as is suggested for the initiation of schemes would be valuable, but I think they should have very strong powers to settle routes and varying claims and to compel the carrying out of the work when a scheme had been finally approved, otherwise dissenting authorities might hang up a scheme indefinitely. With regard to the control and execution of the works there is no insuperable difficulty, but the financial side is often a great obstacle. This could be considerably relieved by simplifying the machinery for the acquisition of land and property, by the reduction of legal charges, by the State advancing capital money free of interest, and also by charges on the users of the roads; the latter could probably be most equitably raised by the toll-bar system. I do not think there would be any difficulty with the cost of maintenance, as the highways authorities would probably undertake this if they had not been required to provide a considerable amount of capital expenditure. The work would probably be confined for several years to initiation and arranging of schemes, as the war has brought about a large reduction of labour and materials and the existing roads have greatly deteriorated, particularly those on which there is mechanically propelled traffic, so that the energies of highway authorities will for many years after the conclusion of the war be required to bring them up again to the standard to which they were attaining in pre-war times; this will also absorb all the moneys which can reasonably be raised from local revenues. Much, however, could in the meantime be also done in the preparation of machinery for the widening, diversion, and other improvements of the existing roadways. This work would be facilitated by the adoption of Mr. Jeffreys' suggestion that county councils be authorised to exercise the powers of the Town Planning Act, also by the simplifying of the present methods for acquiring land and property, and the present legal methods necessary to authorise the diversion of roads and the closing of disused portions.

Mr. H. Percy Boulnois,
Late Deputy Chief Engineering Inspector to the Local Government Board:

I agree with the author that one of the reasons why the Town Planning Act of 1909 has not been more generally put in force is that the local authorities are unwilling to incur unknown liabilities and obligations, which may land them in financial trouble, and it is certainly disappointing to find that only five authorities have hitherto secured town planning orders. There is, in my opinon, another reason, which Mr. Rees Jeffreys does not mention, and that is that the preparation and carrying out of a scheme under the Act involves an enormous amount of work and responsibility, the bulk of which falls on the local surveyor. The emoluments paid to this official are usually far below the value of the work he executes in the ordinary course of his duties, and, as he well knows the extra work which would devolve on him if a scheme had to be prepared and carried out would receive no extra remuneration, it is only human nature that makes him a little lukewarm in his enthusiasm for such a scheme, which would involve a considerable amount of work in addition to his regular duties. With reference to the question raised by Mr. Jeffreys as to whether the Local Government Board can approve single road schemes, this is extremely important, for there are many local authorities anxious to carry out such schemes rather than embark on a more ambitious and wider scheme. It would be very helpful if the Local Government Board would issue some pronouncement on the point.

Mr. J. W. Cockrill,
Borough Engineer of Great Yarmouth:

He had read the paper very carefully, and the suggestions in Part 4 struck him as being likely to be the most useful. He felt that when local bodies and officials who had been lax in the past found that the work was likely to be taken out of their hands they would be very anxious to go on with it. Another very useful suggestion was that with

reference to the Act of 1888. If some powers could be given for dealing with roads between two large centres it would add very largely to the usefulness of town planning.

Mr. E. Willis,

Engineer and Surveyor to the Chiswick Urban District Council.

The suggestions of the author in Part 4 of the paper were excellent, but he wanted to sound a note of warning with regard to extra authorities. He was strongly of opinion that they must not have new authorities, but aim at combination of existing authorities. They might put additional duties if they liked on a combination of authorities in the same way as they had joint drainage boards. If they could reduce the number of local authorities by the combination of small areas he thought, not only in town planning but in local government generally, they would begin to economise in administrative expenses and in many other ways. The suggestion as to a town planning commission had many possibilities, but there were certain risks in connection with such a commission.

Mr. Rees Jeffreys.

It was said, in the course of the discussion, that arterial roads must come. I have no confidence in that "must." The possibilities of the construction of arterial roads are less now than twenty years ago. One of my reasons for arriving at this conclusion is the blind confidence in the State—in Governments—that is shown in so many quarters. For example, my friend Mr. Dryland, one of the most helpful and thoughtful of our county engineers, concludes that "it is no part of the duty of local authorities to construct new roads." He looks forward to a central authority with "adequate powers to lay out and construct the roads" which our legislators, who in future are to pay more attention to the things that really matter (why should they, Mr. Dryland?), will set up. This waiting on the State is, I think, fatal to progress. There was one moment a few years ago when it looked as if the State would undertake those obligations. The moment passed. I doubt if it will ever return. I dissent from the proposition that it is no part of the duty of local authorities to construct new roads. If it is not done by them, it will not be done at all. The difficulties in the way of the Central Government dealing with these matters are practically insuperable. One practical result of this paper and discussion will, I hope, be to restore your faith in local authorities as proper instruments for providing arterial roads. Instead of trusting to the State to construct and to pay for arterial roads, it is better to ask the State to combine areas and constitute local authorities for the purpose.

I should like to say how much I agree with Mr. Boulnois in his remarks as to the difficulties under which the engineers and surveyors to local authorities often work. I have always been an earnest advocate of any measure calculated to improve the status, increase the emoluments, and add to the authority of the surveyors of the local authorities, on whom all progress in road improvements and housing must ultimately depend. Local authorities, I notice, often begrudge their surveyor the assistance, technical and clerical, which he ought to have. It is a "penny wise and pound foolish" policy. One of the reasons why I propose a central town planning commission to organise a technical staff on which local authorities may call is because I think it possible that an overworked surveyor might often get his authority to authorise the temporary employment of a trained man borrowed from the central staff, when they would not agree to the appointment of an additional permanent official. Another is that I should like to see greater interchanges of staff between the central and local authorities. If all officials of central authorities as part of their training served some period in the offices of a local authority, and *vice versâ*, how much more understanding and sympathy there would be between the two classes!

RESUMED DISCUSSION OF MR. REES JEFFREYS' PAPER.

On Friday last, at the Surveyors' Institution, the discussion of Mr. Rees Jeffreys' paper was continued by

Mr. H. E. Stilgoe,

City Engineer and Surveyor of Birmingham,

who said his opinion was that arterial roads could be constructed under the Town Planning Act, and that it was in the best interests of the country that local authorities should be compelled to make town planning schemes for their respective districts—not necessarily complete schemes, which would occupy too much time, but steps should be taken to prevent their great arterial and secondary main roads being built up to in such a manner as to obstruct their widening and improvement without enormous cost. They should also plan new primary and secondary arterial roads. In this connection the building lines of such streets should be defined, and in order to prevent unnecessary overcrowding the limitation of building densities should be laid down. This preliminary town planning scheme could be prepared in a much less time than was now spent upon the preparation of complete schemes, which they knew must include so many other things, such as open spaces, allotments, and so on. It was not always fully appreciated how great an effect the proper planning of the main traffic routes had upon the layout and the cost of estate streets. The inelasticity of practically all by-laws relating to the layout and construction of new streets, or estate streets, placed on the owner the necessity of a given width of carriage way, footway, &c. Owing to the local authority not having the control of the site, or the planning of the direction of the street, a universal specification was applied to such construction, whether it was to carry light or heavy traffic, and these hard and fast by-laws had had a bad effect upon street planning. If the main traffic roads were properly planned under a town planning scheme the estate streets could, subject to the approval of the local governing authority, be constructed on much less costly lines, and thereby the cost of the estate development would be cheapened. It was the planning of the site that was the all-important thing. At the present time only five schemes had been approved, although others were in course of preparation. Why was it that local authorities had not been more active in this work? The misconception prevailed that if an authority embarked upon a town planning scheme it must include everything that could possibly be conceived, and it would be a good thing if that impression were removed. It might be that local authorities fought shy of incurring such liabilities as might attach to a responsible authority, and there was a good deal in that. He knew of local authorities who had said there was a big financial responsibility, but a great deal depended on how much they put in their schemes. If they could be persuaded to prepare preliminary schemes which would include, first, the great arterial roads, and the other two points he had mentioned, it would be sufficient to go on with to secure the object which Mr. Rees Jeffreys had in mind. As to compulsory town planning, he did not know whether any representations had been made to the Local Government Board under sec. 61; as he read the section it did not appear that the board could act unless representations were made. Therefore there was all the greater reason for legislative power to compel town planning. In embarking on a scheme they wanted to take a comprehensive view of the surrounding country and strike out with a bold hand the great lines of communication. It was pretty evident that a small rural council could not be expected to do this unless it had the advice of the trained experts whom Mr. Jeffreys spoke of as being employed by the commission. Then there was the great cost of the arterial roads for through traffic, and he considered that some proportion of this should be borne by the State, some by the county council, some by the local authorities, and a portion by the landowners benefiting thereby. A larger rating area had been suggested, but it was difficult to see how this would operate although at first sight it would seem a fair thing to charge a greater area—say thirty or forty miles radius—with a portion of the cost. It was very difficult to expect small local authorities all to work together to plan and lay out a great traffic road, and county councils must be given a locus under the Town Planning Act. There was no doubt that great simplification of procedure was required, and that could only be brought about by fresh legislation.

Mr. Montagu Harris,

Secretary of the County Councils Association,

said that there seemed to be agreement that what was wanted were larger authorities. What they wanted was to have some Government department which should have the power of doing what local authorities generally were anxious for them to do, as it was expressed by a Royal Commission some years ago—

apply the spur at the border. The great instrument for a Government department of this kind to use was money grants in aid. If they wanted a thing done the best way to get it done was to give a grant in aid or step in and do it themselves. Joint committees seemed to be the line of least resistance, and if a Government department existed to encourage local authorities to form these committees progress would result. If the smaller local authorities were to be forced to combine and the existing larger authorities were also to be forced to combine for certain purposes, they would very probably get all they wanted, with a spur from the central authority which could be provided by a grant in aid. He thought the second commission Mr. Rees Jeffreys proposed, a Boundaries Commission, would be of the very greatest value. It would help enormously to facilitate in the future the combination of different authorities for various administrative duties, and might lead to different authorities understanding one another's point of view a little more.

SIR GEORGE GIBB,
Chairman of the Road Board,

said he did not consider that any great changes in organisation were needed or that they should attempt to take the matter out of the hands of the local authorities. All that was needed was to give local authorities clear and simple powers with a simple procedure to enable them to plan the new roads and sterilise the sites so that they could be built on. Under the Town Planning Act the conditions were too cumbrous, and it was necessary to prepare a more or less complete scheme. In order to get practical progress made the best plan was first of all to lay down the lines of the principal roads which were to serve the area in question. He was not at all afraid of the apathy of local authorities, for he believed if a simple Act of Parliament was passed enabling the local authorities to lay down the lines of the principal roads required for communication there were very few towns in the country and very few authorities in the neighbourhood of towns who would allow bad or inadequate or ill-planned roads to be made. Finance was at the root of the problem, and they had to face it. There was the question of bridges and other works which might be required in connection with a road laid out with a view to through communication as well as local requirements. That was an item of cost which had to be considered and provided for, and there was the compensation to the landowner. Therefore, if these problems were to be solved quickly it was necessary to simplify the procedure and to pass an Act of Parliament to enable local authorities to plan the roads and sterilise the sites at once. If that were done he did not think it would be difficult for joint committees or whatever body might be formed in different localities to get the authorities to agree on the lines of the roads, and in that way they would prevent the land required for the roads being built upon.

MR. W. R. DAVIDGE,
District Surveyor of Lewisham,

urged the necessity of the joint boards having some lucrative business. If they gave them a business to carry on—a new planning business, if they liked—and gave them their own definite revenue, such as the motor tax which had been suggested, success was assured. These joint boards, however, must be local; they must be very considerable in area, and they must control the whole thing and carry it out as a business proposition to ensure success.

MR. REES JEFFREYS,

in replying, said Mr. Davidge had summed it up when he said that they were more or less agreed that it was necessary to get a combination of authorities to deal with the matter, and he hoped the Institute would do its best to bring that result about. After the war things were going to be put into the melting pot, and those people who had the clearest ideas and the most practical proposals as to what they wanted out of that melting pot were more likely to get it, and especially if those ideas were practical. They would have to go a little further than they had that night into the question of finance. He did not want liberal Government grants for town planning. He did not want to have the process of town planning and roadmaking and such things as the getting of liberal grants because it was only possible they would not get them. If they did get such grants so much the better, but as a rule the grants are on such a basis. He had received a letter that day from one of the leading municipalities of England pointing out that for some years to come neither the State nor the municipality would have any money for the utilitarian but unsensational work in connection with roads. They were incurring enormous liabilities in connection with the war, and he could see the petrol tax being seized by the Chancellor of the Exchequer to pay the debt charges which would be imposed on the country. This waiting on the State was, he thought, fatal to progress. It seemed to him they must regard this provision of arterial roads under the Town Planning Act or by any other machinery as the work of local authorities. He did not think for many reasons that the State would ever undertake itself to provide arterial roads. The provision of the arterial roads, which they discussed more fully at a previous meeting, would have to be provided by London, and by that he meant Greater London. Modern London now extended forty or fifty miles from the centre, and it would have to find the money for these roads. Let them start from that basis, and then if they got any additional money from the State they would be able to make much greater and quicker progress than they otherwise would do. The next practical step was to try and induce Parliament to combine existing authorities—to create joint committees for united efforts—and get these bodies constituted and properly equipped in order to get town planning schemes and to provide new roads through areas as they were developed. If they thought out those problems in detail and put before the Local Government Board or any Government charged with the matter practical schemes of that kind, there was some chance of real progress being made.

ROAD MAINTENANCE IN DEER DISTRICT, ABERDEENSHIRE.

In his second annual report, Mr. George S. Barry, the engineer and surveyor for the First or Deer District of the county of Aberdeen, submits an estimate of £8,730 in respect of the 432 miles of roads in his charge, this covering the twelve months ending May, 1918. The great shortage of labour within the district has, he mentions, rendered it impossible to carry out the normal amount of work, and as this shortage is becoming more and more serious it is difficult to know exactly how much can be done. Both agricultural work and peat casting have drawn away a large number of men and greatly affected the progress of the road work.

The prolonged and unfavourable winter rendered the roads less able to bear the large and heavy traffic of the district, and in consequence considerable wear has taken place. In the early part of this year frosts and snowstorms greatly delayed rolling operations and otherwise hampered surface repairs.

Generally, the roads of the district are in fairly good order, the main roads being in a particularly satisfactory condition. However, in certain parts the second and third class roads have suffered considerably through the constant haulage by heavy engines and motor lorries. This is mainly due to these vehicles being driven in the same tracks, and no attempt being made by the drivers to break wheel gauge.

In order to strengthen the roads for traffic requirements, extensive stretches of bottoming have been laid, but it is becoming every day more apparent that a regular scheme of bottoming will have to be put in hand throughout the district at the first opportunity.

In certain parishes large quantities of growing timber have been cut down and hauled over the roads. In one locality this extra traffic has very much weakened the roads, necessitating extensive repairs at an early date. Elsewhere the damage by the timber traffic is inappreciable.

War Bonuses. A special committee of Bethnal-green Borough Council recommends that authority to decide that all previous resolutions of the council relating to war bonuses be rescinded, and that a war bonus of 10s. per week be paid to all permanent officers and to all employees in the service of the council who are in receipt of salaries or wages up to and including £250 per annum, holders of joint appointments, where the joint salary, excluding emoluments, does not exceed £250 per annum to receive 10s. per week between them in equal shares.

Water Supply in the Killarney Rural District.

LOCAL GOVERNMENT BOARD INSPECTOR'S REVELATIONS.

An investigation which Mr. P. C. Cowan, M.INST.C.E., chief engineering inspector to the Local Government Board for Ireland, has made in relation to the water supply of Killorglin, in the rural district of Killarney, has disclosed a state of affairs which, to say the least, is anything but creditable to the local authority.

Mr. Cowan relates that on inspecting the intake from the lake and the filters and filtered water basin at Cummernamuck—about 5¼ miles from Killorglin—he was astonished to find that on account of an unauthorised change in the plans of the filters, made during their construction about 7½ years ago, the water supply was passing through the filters, without any filtration, through the top and sides of manholes provided in the corners of the filters instead of through the bed of filtering materials. The caretaker of the headworks informed him that the supply had been passing in this way for a long period, more than a year, and Mr. A. W. Barnard, engineer to the rural district council, said he had reported the matter to the council last year, but had not been directed to remedy the vital defect at the filters. The sand in the filter beds, about 16 in. deep, was so clean that from its apearance alone it was evident it had not been serving its purpose.

Mr. Cowan subsequently made an inspection of parts of the sewerage system and of the distribution of the water in the town, as well as of four out of five houses in which cases of typhoid fever had developed, and of a dairy about a mile south of the town, from which milk was supplied to two out of the four houses above referred to. Afterwards an inspection was made along the pipe line from the town to the filter beds, and of the headworks, including intake, filters, and clean water basin.

DEFECTIVE SEWERAGE.

It was found that the sewers in the town were not being regularly flushed, and Mr. Cowan recommends that that should be attended to carefully in future. One old flushing arrangement in a manhole, with two tipping tanks provided about thirty years ago, had long been out of order, and caused a nuisance much complained of by the emission of foul sewer air. Another flushing tank provided later than the other was of good type, but had apparently not been used recently, as it was found very difficult to lift the manhole cover over it.

At the back of a number of houses in one street a small drain or sewer, constructed a few years ago, was apparently unable to discharge properly on account of insufficient fall and insufficient flushing, and at the time of inspection was found nearly choked and causing a nuisance by effluvia through a small manhole at its upper end.

Mr. Cowan proceeds to state that although considerable sums have been spent during the past thirty years in providing sewers and a water supply in Killorglin, many of the houses in the town have no sanitary conveniences, and in each of the four houses in which cases of fever occurred, and which were inspected, there were very serious sanitary defects.

The dairy which was inspected is situated about a mile south of Killorglin. Mr. Cowan describes the place as follows: "The only buildings are a long dwelling-house and a thatched cowhouse. The house has two rooms, one old with an earthen floor, the other recently built, with a concrete floor. In the old part of the house almost the only furniture was three beds along the back wall; the other room was practically empty. No place for storing milk exists, and no proper vessels for milk were seen. There is no convenient supply of water, the nearest well being about half a mile away. The internal dimensions of the cowhouse are about 27 ft. by 9 ft. by 6 ft., and the number of cows kept is six, so that the space per cow is 243 cubic feet. The only openings in the cowhouse are a low door and a hole in the thatched roof."

ENCRUSTED AND LEAKY MAINS.

The water pressure in the town is very low, and no water is obtainable at many houses where taps are provided. This appears to Mr. Cowan to be due to encrustation and blocking of the main pipes and communication pipes by a growth containing iron oxides and baggy matters. The head or difference of level between the lake which is the source of supply and the town is very ample, and was considered excessive when the works were constructed, a reducing valve being placed on the 4-in. main to lessen the pressure in the town. Some years ago that valve was removed, but the main, on account of encrustation, and also probably on account of leaks, is now quite unfit to deliver water at proper pressure in Killorglin. The 3-in. branch mains in the town appear to be nearly closed by encrustation. The drop in the level of water in the clear water basin in 24 hours, after shutting off the supply to it, was found on test to be 7 ft. 4 in. The deposited plans show the reservoir to be 30 ft. by 30 ft., so that the quantity of water passing into the 4-in. main in 24 hours is 6,600 cubic feet, or 41,250 gallons, nearly 30 gallons a head for a population of 1,400. The population of Killorglin was 1,087 at last census, but there are one or two fountains on the pipe line and one or two houses are connected with the water main outside the town.

Mr. Cowan observes that these figures, when considered along with the most defective supply in Killorglin, indicate that serious waste is occurring either by leakage on the main pipe line, or by defective fittings, and taps opened during the day when no water is obtainable and left open all night. "Leakage on the main pipe line," he adds, "may occur to a serious extent without water showing on the surface, and the waste through taps, such as that above referred to, is always a very serious matter with an intermittent or inconstant supply. It appears to be of much importance that all special supplies inside and outside the town area should be given through meters, though these require careful attention to keep them in order with boggy waters."

NEGLECTED WORKS.

The history of the Killorglin waterworks for most of the time since the completion of the original works Mr. Cowan regards as most unsatisfactory, and the sanitary authority, he asserts, have lamentably failed to take the necessary care to maintain a fairly satisfactory system, provided at considerable expense, in good order. The results of this failure have been the loss for long periods of the immense advantages a continuous and abundant supply of water confers on a town, and the exposure of the people of Killorglin to very serious inconvenience and hardships and no small degree of danger. Sanitary fittings dependent on a continuous supply of water become a menace to public health when the supply is not ample and regular.

"There is no doubt," Mr. Cowan proceeds, "that the district council were at times badly served by the persons employed to advise them, to supervise repairs, connections, pipe clearing, and ordinary maintenance, but the council cannot be relieved from responsibility on that account, as they were not careful in the selection of their servants. To secure good results from town waterworks they must be carefully maintained in good order by competent and careful persons. In this case the caretakers had practically nominal salaries, and in consequence appear to have considered their duties to be nominal, and their discharge of them was practically unchecked. In 1904 a loan of £1,902 was sanctioned for the improvement and extension of the waterworks which had been very urgently required for some years, but not till April, 1910, was any substantial work carried out, and then on lines much less satisfactory in some respects than those contemplated nearly six years before."

At a meeting of the Killarney Rural District Council in November, 1910, a report was considered from Mr. A. W. Barnard, the engineer, advising: "That the waterworks, sewerage works, and all works connected with same should be inspected periodically by the engineer, for him to report to the council, and, if satisfactory, sign curator's account." The council ordered Mr. Barnard's recommendation to be carried out, but the history of the waterworks during the last 6½ years appeared to indicate that the periodical inspections and reports were not made. In December, 1915, Mr. Barnard reported that the walling around the outlet from each of the filter beds and the surface around manholes required to be concreted, at a cost of £9. The order of the council was—"Repairs not to be carried

out." The repairs were absolutely required to make the filters of any use, as the water was evidently passing through the manholes and not through the sand.

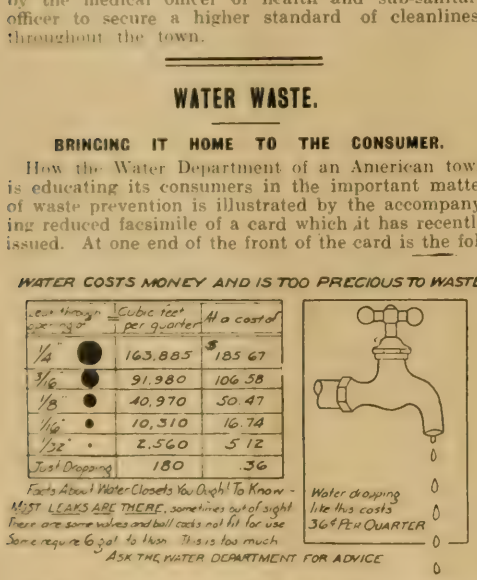
RECOMMENDATIONS FOR IMPROVEMENT.

The results of recent chemical and bacteriological analysis of samples of the water show that the supply, though not of the highest class, is a safe water for a town supply, and that there is no reason to think the use of the water had any part in the causation of recent cases of fever in Killorglin. Mr. Cowan has no doubt, however, that the frequent failure of the water supply, due to bad management, has made it impossible to keep the sewers, drains, and sanitary fittings in the town properly flushed over long periods, and rendered it difficult for the townspeople to be cleanly in their persons and surroundings. But he considers there is no reason why the existing waterworks should not, in their present form, with small but important improvements, between the lake and the clear water basin, be made quite satisfactory and maintained in that condition. It would be essential, however, to take the most careful steps for the faithful execution of the necessary works of rectification and improvement, and the townspeople must be prepared for a further somewhat lengthened period of inconvenience, and for some private expenditure on improved fittings and taps before a supply ample in quantity and pressure could be secured throughout the town. He insists at the same time that the other matters relating to flushing tanks, blocked sewers, untrapped drain openings, absence of sanitary conveniences, &c., should receive early attention from the district council, and that steady pressure should be applied by the medical officer of health and sub-sanitary officer to secure a higher standard of cleanliness throughout the town.

WATER WASTE.

BRINGING IT HOME TO THE CONSUMER.

How the Water Department of an American town is educating its consumers in the important matter of waste prevention is illustrated by the accompanying reduced facsimile of a card which it has recently issued. At one end of the front of the card is the following:


WATER COSTS MONEY AND IS TOO PRECIOUS TO WASTE
Cubic feet per quarter
At a cost of
1/4 163.885 $185 67
3/16 91.980 106 58
1/8 40.970 50 47
1/16 10,310 16.74
1/32 2.560 5 12
Just Dropping 180 .36
Facts About Water Closets You Ought To Know -
MOST LEAKS ARE THERE, sometimes out of sight
There are some valves and ball cocks not fit for use
Some require 6 gal to flush This is too much
Water dropping like this costs 36¢ PER QUARTER
ASK THE WATER DEPARTMENT FOR ADVICE

leaving. "The meter shows an excessive consumption of water. As we are compelled to charge for all water registered by the meter, this ought to have your immediate attention. This notice is not obligatory on our part, but indicates a desire to co-operate with you in stopping an apparently needless expense."

Damage to Weighbridge. The Commercial Motor Users' Association has just been successful in winning an important action on behalf of commercial motor users. A claim of £85 10s. was made by the Towcester Gas Company against a member of the association for damage to the plaintiff's weighbridge in Watling-street caused by the defendants' steam lorry being driven over the weighbridge and through it. The plaintiffs sought to prove that the defendants were trespassing in that the weighbridge was only dedicated as part of the highway subject to the limitation that only carriage traffic of such weight as could be borne by it should pass over it; that the driver was guilty of an unlawful act in being on the wrong side of the road; that the lorry carried insufficient lights, and that the lorry was not duly licensed or registered. Justice Radcliffe found for the defendants on all these points, and gave them judgment with costs against the gas company.

TOWN PLANNING INSTITUTE.

PRESIDENT'S REVIEW OF THE YEAR'S WORK.

Prior to the resumption last Friday by the Town Planning Institute of the discussion of the paper by Mr. W. Rees Jeffreys on "Road Construction and Improvements by Means of Town Planning Schemes," the third annual general meeting of that body was held at the Surveyors' Institution, Great George-street, Westminster. Mr. J. W. Cockrill, the president, occupied the chair, and others present included Sir George Gibb, chairman of the Road Board, and Messrs. J. A. Webb, engineer and surveyor, Hendon Rural District Council; W. T. Lancashire, city engineer, Leeds; E. Willis, engineer and surveyor, Chiswick Urban District Council; W. L. Carr, engineer and surveyor, Ruislip-Northwood Urban District Council; H. E. Stilgoe, city engineer, Birmingham; W. R. Davidge, district surveyor, Lewisham; E. W. Turner, town planning assistant, Birmingham Corporation; W. Rees Jeffreys, secretary of the Road Board; Francis Wood, borough engineer, Fulham; W. Gale, engineer and surveyor, Carshalton Urban District Council; W. Hedley Grieves, engineer and surveyor, Sutton Urban District Council; A. Dryland, county surveyor, Surrey; H. T. Wakelam, county engineer, Middlesex; and D. Sutherland, engineer and surveyor, Southgate Urban District Council.

RE-ELECTION OF COUNCIL.

The following were re-elected to the council:—

Architects.—Prof. S. D. Adshead (vice-president) and Messrs. A. S. Soutar, P. B. Houston, P. T. Runton, H. V. Lanchester, and R. Unwin (past president).

Engineers.—Messrs. J. A. Brodie, J. W. Cockrill (president), W. T. Lancashire, H. E. Stilgoe, J. A. Webb (associate member), and E. Willis (associate member).

Surveyors.—Messrs. T. Adams (past president), W. R. Davidge, T. H. Mawson, G. L. Pepler, and G. N. Dixon (associate member)

Legal Members.—Messrs. E. R. Abbott (senior vice-president), C. Hubbard, and R. A. Reay-Nadin.

Legal Associate Member.—Mr. C. P. Lovelock.

Associate Member.—Sir R. A. Paget, Bart.

Hon. Member.—Mr. W. R. Jeffreys.

Ex-Officio Member.—Prof. P. Abercrombie (hon. librarian).

Replying to a vote of thanks proposed to him for his work as president during the past year, Mr. Cockrill observed that the council of the institute had been by no means idle during that period. Its labours included the framing of a provisional scale of professional charges and regulations for the conduct of town planning competitions. The examination syllabus drawn up for use after the war gave a most comprehensive statement of the work necessary in preparation for the important duties ahead of a would-be practitioner. A memorandum with regard to town planning after the war had been drawn up and presented to the President of the Local Government Board. The institution was still growing in numbers, twenty-one members having been added in the year, an increase of upwards of 12 per cent. Finances were also improving, and £100 had been invested in the War Loan. Other societies and institutions continued to give the institute assistance, and they had to thank the Surveyors' Institution and the Institution of Municipal and County Engineers for the use of their rooms for meetings. The former accommodated the growing library, where it might be consulted by members, a fact which should be known to all. The war stopped progress still, but they hoped that its blighting influence would soon have passed, and that the help which the United States would give in the matter would be as real as their help in town planning. For the consideration of the council and institution generally, in a very difficult year, he was deeply grateful, and ventured to hope that the year had not been entirely barren in results which would leave their mark in the history of the institution.

Bradford's Waterworks.—The Angram part of the Nidd Valley waterworks scheme, of which Mr. James Watson was engineer, has now been completed, and the final accounts presented. The original contract price was £865,000, and the accounts show that this sum has only been exceeded by between £2,000 and £3,000, or less than 1 per cent on the contract figures. The contractors were Messrs. Best & Sons, who have been informed of the Bradford Water Committee's appreciation of their work.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Why is it that the Reconstruction Committee recently formed by the Government does not include a single representative with an expert technical knowledge of roads? Is it not evident that one of the first questions that will arise after the war will be the problem of how to reconstruct the roads which have been allowed to fall into disrepair, and will require the expenditure of much money and careful thought to bring them up to the standard that will enable them to bear the traffic of the future? Is it not to be hoped that it is not too late to include on the committee the name of someone who thoroughly understands this question?

* * *

Have not surveyors throughout the country a difficult task at present in securing the services of competent steam roller drivers, as any man who is competent for such work is always able to obtain employment elsewhere at higher wages than are offered by local authorities? Is there not also the difficulty that, if an "ordinary" man is trained by the surveyor to undertake this duty, he no sooner becomes efficient than he takes a more remunerative position elsewhere?

* * * *

Was not the article in THE SURVEYOR of June 1st on "Road Work in the Mexican Desert" an eye-opener as to what engineers can do in the way of opening up a desert country by the construction of roads and bridges? Who was the poet who wrote:

> "If all the world were flat and smooth
> There'd be no masterful creation:
> The chasm to the engineer
> Means bridges, roads, and reputation"?

* * * *

Is it not the duty of every citizen to try and assist the Director-General of Food Economy in making as public as possible the necessity that has arisen for economy in foodstuffs, especially grain, and loyally to comply with the appeal:

EAT LESS BREAD?

* * * *

Is it not a suggestion well within consideration that there should be a "secret session for engineers," at which selected engineers should receive instruction as to the submarine dangers, and generally as to our engineering needs to assist in winning the war? Are there not a large number of engineers in this country who might be of the greatest value to the Government, if they only knew the directions in which their help is required? Would it not be to the advantage of the country if the Government would only take a few more reliable and "brainy" people into their confidence?

* * * *

Was it not very satisfactory to read in the recent "Honours" list that a C.B. had been conferred on Mr. H. H. Law, the able and courteous Chief Engineering Inspector of the Local Government Board, and on Brigadier-General Maybury, the engineer and manager of the Road Board, who has done such excellent work in reorganising the methods of road construction and maintenance at the front? Do we not all congratulate these two "municipal officials" on their well-earned honours?

* * * *

Should surveyors take it as a compliment, or not, that "Dagonet" in the *Referee* of June 3rd draws attention to the sad condition of our roads—which, he says, are "dirt"—and that we run the chance of the face of England being converted into one vast morass? But is not "Dagonet" quite wrong when he compares English roads unfavourably with those on the Continent? Is it not a well-known fact that whereas Continental roads were well alligned and contoured, their surfaces were mere skins, which speedily broke down when heavy and fast motor traffic was introduced?

* * * *

Would it not seem that the Americans take the war much more seriously than we did on the outbreak of hostilities, three years ago, when we find that the American Society of Civil Engineers has abandoned its forty-ninth annual conference, which was to have been held from June 12th to 15th, the official explanation being "the present condition of war, which involves the absence of many members of the society in the service of their country"? Is it not evident that our new Ally the United States of America mean to "take their coats off" and tackle the job thoroughly?

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάνθ' ὁρᾷ

(One man does not see everything.)

—EURIPIDES.

DAMAGE TO ROADS BY TIMBER HAULAGE.

To the Editor of THE SURVEYOR.

SIR,—Judging from the numerous reports and complaints reaching the Roads Improvement Association in regard to the serious amount of damage which has been caused to roads in various parts of the country, especially in rural districts, by the haulage of timber for Government purposes, and the dissatisfaction which undoubtedly exists as to the question of responsibility therefor, the time would seem opportune when some concerted action on the part of the authorities directly concerned should be taken with a view to arriving at a mutual understanding with respect to the reinstatement of the roads so affected. So far as I am aware, no definite united action has been taken, although in many instances the authorities concerned have been in communication with the Ministry of Munitions and other Government Departments upon the subject. It will be, I think, admitted that the nature of the traffic undoubtedly constitutes what is termed "extraordinary traffic," and as such the parties directly or indirectly causing it would be responsible to the authorities for payment of compensation. To saddle authorities, especially those of low rateable value, as many rural ones are, with the entire cost of reinstating the roads in their districts would have the effect of seriously increasing the rates and inflicting hardship upon the already overburdened ratepayers.

Therefore, if a joint conference could be arranged with the Government Department directly responsible for the supply of timber where haulage over roads is necessary, the question of responsibility and payment of compensation, or a grant in aid of the reinstatement, might probably be mutually and satisfactorily arranged.—Yours, &c.,

JAMES D. HAWORTH,
Acting Secretary,
Roads Improvement Association.

15 Dartmouth-street,
Westminster, S.W. 1.
June 5, 1917.

QUICKLIME FOR BLASTING.

To the Editor of THE SURVEYOR.

SIR,—We notice the letter from "Inquirer" respecting lime for blasting purposes. He asks if your readers can give any further experience or cases where quicklime is used for this purpose. We remember many years ago lime cartridges were tried in the county Durham for breaking down coal, a jet of water forced into the cartridge of quicklime giving the expansive force necessary. As the method does not seem to have been widely used we presume it was not found successful. As far as we can recollect, an experiment was made in the matter by Messrs. Pease & Partners, Darlington.—Yours, &c.,

JNO. HUTCHINSON.
Director, Cwmavon Slag Company, Ltd.

Western Mail Chambers, Cardiff.
June 2, 1917.

Coast Sand Dunes. (By Gerald O. Case, St. Bride's Press, Limited, 24, Bride-lane, E.C. 4, price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Property Owners and Repairs.—The way in which some property owners are alleged to flout the sanitary authorities came up (the *Birmingham Evening Despatch* reports) at a meeting of Walsall Rural District Council last Friday. It was complained that certain properties at Pelsall had to be put in a habitable condition, and that the estimates sent in were not adequate. Mr J. H. Caster (a member) said the sooner they had done with private ownership the better. It was things of this kind that disgusted one. He found that when the owner was a person of small means he was more pressed to do work on his property than people in a better position. People of small means were compelled to repair property, but others took advantage of their positions to get out of their responsibilities. The Chairman: I don't agree with you. Eventually the surveyor said he would inspect the property referred to.

NOTES FROM IRELAND.

Specially Contributed by an Irish Correspondent.

[In the hope of making these notes as practically useful as possible the writer invites readers to favour him with communications thereon from time to time. They might be constructively critical, or helpfully supplementary, might indicate new points upon which information is desired, or might merely convey information. Communications will reach the writer if addressed "Irish Notes," 24 Bride-lane, Fleet-street, E.C. 4.]

Housing Difficulties. The acute difficulties of housing the working class were shown at a recent inquiry in Dublin regarding an application by the corporation for sanction to a loan for the erection of seventy-five three-roomed houses on an area of 3 acres lately cleared of slum dwellings. The nett building cost was estimated at £215 per house, and after taking credit for 5s. 6d. a week rent per house the anticipated loss per house per annum is £12, quite apart from the cost of the land, new streets or sewers. Taking this cost into account, the estimated annual deficit on the scheme is about £22 per house. There is a great division of opinion in Dublin on the question as to where new houses for the working classes should be erected. A majority of the corporation favour building in the centre of the city after clearing away slums. The Housing Committee of the Chamber of Commerce, on the other hand, and many of the most enlightened citizens are in favour of building on open land on the outskirts, where small gardens can be attached to the new houses, and this view was ably presented at the inquiry by Sir John Griffith, M.Inst.C.E., and Sir James Shanks, a former Lord Mayor. The corporation urged that the 3 acres of land acquired and cleared at a cost of about £7,500 should not be left derelict, and that it should be developed at a further cost of £5,500 for streets, sewers, and a playground, and utilised for the erection of seventy-five houses.

* * * *

There is much to be said for both policies, but the case shows, first, that it is practically impossible to build houses and let them at rents within the means of the poorer members of the working classes, even if free sites are obtainable; and second, how terribly the difficulty of the housing problem is increased when sites are secured by clearing slum areas at a cost of about £174 per house, as in this case. Since December, 1914, the cost of building in Dublin has increased at least 25 per cent. and, unfortunately, the rate of interest for Government loans is now 5½ per cent against 2¾ per cent fifteen years ago. Doubtless some elements in the Dublin estimates, such as £3 per annum per house for maintenance and painting, are very high, but it seems quite clear that unless loans can be given at a very low rate of interest for housing schemes the great need of homes for the working classes cannot be supplied on either side of the Channel.

* * * *

Water. A recent inspection of waterworks in the West of Ireland showed that filters provided some years ago at considerable expense had been rendered quite useless by the unauthorised provision of two manholes inside the filters and level with the sand. The water, instead of passing through the beds of filtering material, found an easy passage through the manholes. It is much to be regretted that better care is not taken of waterworks in connection with small towns. Unless carefully maintained such works invariably soon fail to serve their purposes, and in some cases become a danger rather than a blessing to the community for which they are provided. Not long since a request was made by the owner of a mill in Ireland for a loan from Government for the provision of pumps to lift water from the tail race of his waterwheel back to the dam. Needless to say, the loan was refused. It is a pity that a less disinterested person who lately urged that the development of the resources of Ireland as the true solution of the Irish question should have taken into consideration water power in the country. Unfortunately, except for a few months of the year little power can be got from the Irish rivers, and even on the Shannon and Corrib stand-by plant is necessary to ensure throughout the year the supply of very moderate power for pumping and manufacturing purposes.

* * * *

Peat for Power and other Purposes. The question, Can the immense deposits of peat in Ireland be utilised for the production of power and such by-products as sulphate of ammonia and liquid fuel for motors? is again receiving much attention. Schemes which were urged as hopeful ten years ago appear now to be quite feasible, considering the high cost of coal and of freights. It is not expected that the price of coal in Ireland is ever likely to fall below £1 per ton. It now costs from £2 to £2 10s. There is evidently a wide field for enterprise in connection with peat, and an unofficial committee of engineers has been formed on the initiative of the Irish Branch of the Institution of Electrical Engineers to consider the questions involved. The successful use of peat in a gas-producer plant by Mr. Hamilton Robb, of Portadown, shows that power and by-products from the combustion of peat might be obtained in great quantities from the Irish bogs. The power could be transmitted by overhead conductors to a distance, or could be used for the manufacture of carbide of calcium, or for the manufacture on the spot of nitrogen products, such as are made in Norway and elsewhere where cheap power is available.

COMPARISON OF STRUCTURAL MATERIALS.

The following comparisons of the adaptability of the various types of masonry were presented in an address by Mr. Horace R. Thayer, of the Carnegie Institute of Technology, at the Engineers' Society of Western Pennsylvania:

Stonework is being limited more and more to cases where appearance is a vital factor. Even here various methods of treating concrete are being developed which are lessening the former objection to its rough and monotonous exterior. Furthermore concrete is cheaper for a given strength, and is fire-resisting, while stone is not.

Brickwork still continues to hold its own for thin walls, where the stresses are light and a good appearance is demanded at a minimum cost. It is a first-class fire-resisting material, but is ill-adapted to resisting earthquake shocks.

Concrete is an excellent material. It is strong and in general durable and fire-resisting, but quite brittle. Reinforced concrete has all the advantages of the plain variety without the last-named disadvantage. The plain material is best for walls and foundations, where its large bulk and weight are not objectionable. At equal costs, it is always better to carry a load by a weight than by a stress, for the consequences of minor faults may be much more serious in the latter case. Reinforced concrete is the proper material for arches, culverts, bridges of short span, and buildings of low or medium height.

Timber should be employed for temporary structures exposed to the weather where the duration is not expected to exceed ten to twenty years, or where extensive alterations may be expected in that time. For a building these limits may be somewhat extended. The above advice presupposes, however, that there is no extensive conflagration hazard. While timber may be made as safe a fire risk as steel in many situations, it is more dangerous to the structure alongside.

Steel will be recognised as one of the principal competitors of reinforced concrete. The advantage of the latter is its durability. On the other hand, we might protect the steel, in which case we are likely to find it somewhat higher in cost. The writer, however, prefers the steel in many instances, because he feels that it possesses far more security, due to less liberal assumptions and greater ease of repair or alterations.

Local Authorities and Coal Distribution.—A scheme to purchase a large amount of coal to maintain the supply during the forthcoming winter to the inhabitants of Bootle was adopted by the corporation of that town on Wednesday.

Employment in Restricted Occupations.—As from yesterday, permits for employers to engage men in the restricted occupations groups will be issued only by the Sub-Commissioners of the National Service Department, instead of the Employment Exchanges.

Modern Road-Making Machinery—Its Selection, Use and Care.*

By. W. HUBER, A.M.CAN.SOC.C.E., Assistant Engineer, Ontario Department of Public Highways.

A discussion of modern road-building machinery resolves itself into a discussion of road-building itself, for very few operations in the construction of our highways, especially where the work is on an extensive scale, are carried on without the aid of machinery of one kind or another. The measure of success achieved and the economies effected through this extensive use of machinery will depend principally on three things: intelligent selection, competent operation, and careful maintenance.

Road construction is carried on under widely varying conditions, and the selection of machinery for any operation involves a careful study of these conditions. The capacity of the machines to be purchased, the power required, the most desirable weights for rollers, &c., should be carefully determined in advance. Equipment once used and found unsuitable cannot be sold or exchanged except at a heavy discount, and it therefore behoves the purchaser to make no initial mistakes.

THE HUMAN FACTOR.

The progress of the work and the interests of the machinery itself demand the very best class of operators. No machine is endowed with human intelligence, nor is any road-making machine automatic in action. Success depends on human guidance and control, the efficiency of which is reflected in the results. While the various operations included in the construction of county roads may be classed as rough work, they require much skill and intelligence of a certain kind, and the lack of these two great essentials is sufficient to prevent results otherwise obtainable with even the best equipment.

Nearly all machinery begins to deteriorate as soon as it begins to work, and this is especially true of road-making machinery. Working amid dust and dirt, exposed to all kinds of weather, and subjected to rough handling, the depreciation is great. Unless such machinery is carefully maintained, its capacity will be reduced, while at the same time the cost of operation will be increased, the result being lower efficiency, higher costs and less satisfactory work.

The ordinary operations in the construction of county roads are grading, quarrying, crushing, hauling, rolling and watering. Each of these operations is now performed by up-to-date machinery as against more or less primitive methods formerly in use. In view of the fact that these several operations are now carried on almost entirely by the use of machinery, it is readily seen that efficiency in road construction may be greatly increased through the careful choosing of machines and their operation in such a manner as to produce the best results.

THE SELECTION OF A ROLLER

The stone having been placed on the road, the next, and in many respects the most important, operation is that of rolling. The intelligent selection of a roller requires the careful consideration of a number of points. First, the weight must be decided on, and will be governed principally by the subgrade on which it is going to work. Motor-driven rollers having in recent years come into prominence, the choice between steam and gasolene or kerosene may well be considered. Owing to its longer and wider use, steam is more generally understood, and it has heretofore been easier to find operators who understand steam engines than those conversant with gasolene motors. This condition is rapidly changing, and with the greater simplicity and increasing reliability of gasolene engines, together with the greater number of men who really understand them, the motor roller is rapidly gaining in favour; and further, it has a number of advantages over the steam roller.

The greatest wear on a roller is seen on the rear rolls, which soon become rounded. When this occurs consolidation is slower and not so well done. With rear wheels having detachable rims such as are supplied on certain rollers, the cost of renewing the rims is much smaller than where the entire wheel must be purchased.

* Abstract of paper read before the Canadian and International Good Roads Congress.

THE GOVERNING FACTOR IN THE ORGANISATION

The roller is, or should be, the limiting factor of the organisation, and as it is the most expensive part of the outfit, it should be worked to capacity. It is a comparatively easy matter to suit the other operations—quarrying, crushing, hauling, grading, &c.—to the capacity of the roller. For this reason it will pay to secure the most capable operator obtainable. His duties are twofold—to obtain the greatest amount of effective work from the roller, and to keep it in a condition of maximum efficiency. Having secured such a man it is advisable to hold him at almost any cost, for the savings he can effect will amount to many times his wages.

The principle on which all rolling should be done is that of securing the utmost consolidation with the least work. It must be so performed that each passage of the roller accomplishes something in the final consolidation of the stone. For efficient consolidation the stone must be rolled and finished as soon as possible after it is delivered to the road. Furthermore, satisfactory consolidation can be secured only when the stone is confined at the sides. Unless a shoulder of some kind is furnished to keep the stone within the required width the weight of the roller on top will cause it to spread and form a thin edge which is easily broken off, at the same time destroying the crown of the finished road.

MECHANICAL HAULAGE

A large part of the work and expense of road building lies in the transportation of materials. Frequently stone and gravel must be hauled long distances over roads which are none too good, and any considerable saving which can be effected in haulage costs will materially reduce the cost of the finished road.

Low traction haulage costs are dependent on the selection of machinery most suited to the exact conditions under which the work is to be done, to the careful operation of the machinery, and on the organisation and planning of the work in such a way as to eliminate all delays. If these conditions are complied with, there is no doubt as to the economy of traction haulage. Otherwise, through the employment of unsuitable equipment, delays caused by breakdowns, and intermittent or interrupted work, the cost may equal or exceed that of well-directed team haulage.

WEIGHT OF EQUIPMENT.

A common mistake in the purchase of hauling machinery is that of selecting equipment which is two large and heavy. Better results can usually be obtained from reducing the size of the car and increasing the number. One advantage attending the use of smaller cars is that where a steep hill on a route compels a slight reduction of the load it may be accomplished by the dropping of a single car. If two or three large cars are used the dropping of one car means the reduction of the load by a much larger percentage than when only one of a larger number of small cars is removed.

The motor truck has very recently come to the front as an important factor in the transportation of materials. Where hauling is to be done entirely over roads of the best class, the selection of this form of haulage may well be given consideration.

MAINTENANCE SUGGESTIONS

Care of machinery during periods of idleness is almost if not quite as important as its care during operation. A few months' exposure to the elements, or to conditions promoting rust, will cause greater depreciation than a whole season's legitimate use. Careful attention to its protection at such time should result in longer life and smaller repair bills.

Summing up, modern road-making requires modern machinery. In order that it may give best returns for its cost it must be exactly suited to the work it is doing, it must be operated by competent men who know how to get results from it, it must be operated without loss of time, and it must be kept under experienced supervision and carefully maintained. Failure of any equipment to accomplish all that is expected of it may usually be traced to the violation of one or more of these rules.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Chichester T.C.—The borough surveyor, Mr. F. J. Lobley, has been instructed to prepare a scheme for converting the Butter Market into the headquarters of the fire brigade.

Dundalk U.D.C.—The council have decided to construct a public convenience in Barrack-street.

Worcester T.C.—The Health Committee recommend the city corporation to establish a municipal milk depot, including the erection of a cowshed, at a cost not exceeding £500.

Worthing T.C.—It was reported at the town council on Tuesday that the directors of the pier company were prepared to recommend their shareholders to entertain the sale of the property to the corporation, and that the council in committee had decided to negotiate for the purchase of the property on terms to be mutually agreed.

HOUSING AND TOWN PLANNING.

Briton Ferry U.D.C.—The surveyor, Mr. H. A. Clarke, has received instructions to prepare a further housing scheme.

Dudley T.C.—The Housing Committee have engaged the services of Mr. E. W. Turner (superintendent of the town planning department of the city engineer's and surveyor's office, Birmingham) to advise on surveying matters in the preparation of a town-planning scheme, including the question of new roads, streets, &c. They recommend that a town plan be prepared in respect of the whole of the land unbuilt upon in the borough, and such land adjacent thereto as may be necessary to make a complete and effective scheme for the borough, and that the councils of adjoining districts affected be asked to co-operate.

Maidstone T.C.—The borough surveyor, Mr. T. L. Bunting, has been asked to prepare a plan showing the land available for building and suitable for a town-planning scheme.

Uxbridge U.D.C.—The surveyor, Mr. W. L. Eves, has been instructed to submit a report on a scheme for the provision of thirty-four working-class houses.

Willenhall U.D.C.—The surveyor, Mr. T. E. Fellows, has prepared a development scheme for the district in support of which upwards of £1,300 has been subscribed voluntarily. The proposal includes the purchase of 56 acres to be used as a park and for building purposes. The plans provide for four main arterial roads on each side of the park.

Worthing T.C.—The Sanitary Committee have submitted a scheme for the erection of workmen's dwellings. Of three alternative schemes the one favoured by the special sub-committee provides for the erection of cottages in pairs only, each containing a living-room, scullery, larder, &c., on ground floor and three bedrooms on the first floor, the estimated cost being £244 per cottage exclusive of land, the houses to let at a weekly rental of 8s. The Sanitary Committee, to whom the sub-committee had reported, expressed the opinion that the dwellings should be let at a rental not exceeding 7s. a week, and as the proposed cottages could not be built to let under present conditions at less than 7s. per week the Local Government Board should be approached to ascertain whether there was any prospect of financial assistance being given by the Government to schemes such as this, so as to render possible the provision of dwellings at a rent within the means of the working classes without involving a charge on the rates. The town council have decided to ascertain the views of the Local Government Board with respect to this proposal.

MOTOR TRANSPORT.

Arbroath T.C.—It is proposed to introduce motor haulage in connection with the fire engine.

East Ham T.C.—The purchase of electrically driven dust vans is being considered by the Health Committee, who have deputed representatives to visit Isleworth and Ipswich to inspect the vehicles in use there.

Gloucester T.C.—In order to avoid sending the motor fire engine to fires within the city which could be dealt with by the first-aid appliances or hose attached to the street hydrants, it has been agreed to purchase from Messrs. H. Stephens, Son & Co., Bristol-road, Gloucester, a second-hand car for £100, and to have it repaired, altered and fitted with the necessary appliances for a further sum of £92.

Manchester T.C.—The Watch Committee have agreed to purchase two more motor fire engines.

Oldham T.C.—The town council have accepted from Mr. John Leigh the gift of a new motor ambulance.

Worcester T.C.—The Electricity Committee recommend the purchase of a 5-ton wagon with hydraulic tipping gear for £875.

REFUSE COLLECTION AND DISPOSAL.

Birmingham T.C.—The Lighting, Stables, and Refuse Disposal Committee report the steps taken to convert slaughter-house offal into pig food, which they are convinced can be carried on profitably, and further state that during the year 400 tons of waste paper were collected.

ROADS AND MATERIALS.

Brigg R.D.C.—An intimation has been received from the Road Board that they will ask the Admiralty for a contribution of £2,190 towards the cost incurred by the council in making and improving certain roads in North Killingholme.

Newry No. 1 R.D.C.—The council have agreed to purchase a new stone-breaking plant, at a cost of £268. The surveyor said the new plant would easily break 60 tons per day—twice the output of the present plant—and at a considerably reduced cost.

Newry No. 2 U.D.C.—It was reported that only one of the seven ordinary road maintenance contracts had been tendered for, and none of the eight special works. The contract system, it was stated, "was burst." The chairman: Dead and buried. A motion that the county council should be recommended to give the proposals not tendered for into the hands of the county surveyor for execution was defeated in favour of an amendment that the proposals should be struck out for the present.

Northants C.C.—It has been decided to resurface the main road from Kilsby and Crick Station to the county boundary at Lilbourne, at an estimated cost of £6,870.

Wilton R.D.C.—It is proposed to repair Burcombe-lane, at an estimated cost of £300.

Woolwich B.C.—An intimation has been received from the Ministry of Munitions agreeing to contribute one-fourth of the doubling of the tramway track in Plumstead-road, subject to a maximum contribution of £7,500. The borough council are asking the London County Council to contribute £15,000 towards the cost of the work.

SEWERAGE AND SEWAGE DISPOSAL.

Brackley R.D.C.—The proposed sewage disposal scheme for Eydom has been approved by the local parish council.

Clitheroe R.D.C.—Plans and an estimate are to be prepared for the treatment of the Wiswell sewage at the Barrow disposal works.

Hexham R.D.C.—The council have referred to committee a proposed scheme of sewerage and sewage disposal for Corbridge and Wylam, estimated to cost £10,932, and also a scheme of sewage disposal for the village of Acomb. The work will not be undertaken till the conclusion of the war.

Lathom and Burscough U.D.C.—The council have resolved to renew their application to the Local Government Board for a loan to purchase the freehold of their sewage farm at Burscough. The site contains a little over 13 acres, and the price asked is £1,600.

Newry No. 1 R.D.C.—It was reported that Parliament was expected to confirm the Rathfriland sewerage scheme, and the clerk stated that he hoped to be

able to satisfy the Treasury that the work should proceed on the grounds of urgency and necessity. If they could not obtain money from the Treasury they would have to get it somewhere else, for the work must be done. The council decided to apply to the Local Government Board for sanction to the required loan.

Uxbridge U.D.C.—An estimate has been sanctioned for renewing a filter bed at the sewage works with furnace clinker.

WATER, GAS, AND ELECTRICITY.

Axminster U.D.C.—A scheme has been prepared for additional water supply works, and it will be submitted to the Local Government Board for approval.

Barnstaple T.C.—It has been decided not to light gas or electric lamps until September 1st.

Barrow T.C.—The nett profit of the electricity undertaking last year was £11,223, as compared with £12,804 in 1916.

Birmingham T.C.—The Water Committee have entered into arrangements for again raising the river Blythe, the source of supply which was abandoned when the Welsh scheme was completed, also the resumed possession of the Aston reservoir, which was leased to the White City, Birmingham, Limited, but abandoned by the latter.

Lincoln T.C.—The electricity undertaking enjoyed a record year of prosperity in 1916-17, the nett profits being £3,129, as compared with £1,690 for 1915-16. The gas undertaking is reported to be in a satisfactory position, but it was stated that the Gasworks Committee would have to ask the town council to increase the price of gas, for when the war was over £10,000 would be required to set the works in proper order.

Malton U.D.C.—In consequence of the excessive consumption of water, the average having risen to 40½ gallons per head, the council have resolved to publish handbills warning the public against waste. It has also been resolved to raise the water rate for cottages from 1s. 8d. to 2s. 8d. each.

Morecambe T.C.—The Parliamentary and Properties Committee considered the question of the constitution of a joint water board, and it was resolved that a scheme and plans of the district be prepared and submitted to the committee, and that information be obtained as to the work and management of other water boards.

St. Annes-on-Sea U.D.C.—The Electricity Committee are promoting a scheme for the extension of the electricity works.

Spenborough U.D.C. — The council have agreed to make a grant of £200 to the gas engineer for special services rendered in connection with the construction of the new gasworks, which cost over £40,000. It was stated that during the past year the gas undertaking had made a nett profit of £4,000.

Torquay T.C.—It was reported that there had been a loss of £648 on the year's working of the electricity undertaking, and it was decided to make a slight increase in the price of current, which it was estimated will add £400 to the revenue.

Willesden U.D.C.—The council have agreed to participate in a conference proposed by the Ealing Town Council to consider the provision of a central bulk generating station for a number of West London municipal authorities.—The council are again urging the Local Government Board for sanction to a loan for the construction of an additional high-tension cable, and an extension of the high-tension mains.

Worthing T.C.—It was reported that the year's working of the electricity undertaking had resulted in a deficiency of £1,903. Last year the loss was £367. It has been agreed to meet the deficit by drawing on the reserve fund and selling out war stock standing to the credit of the fund.

MISCELLANEOUS.

Birmingham T.C.—The profit of the tramway undertaking last year was £76,290, of which £66,205 was added to the reserve fund, and £10,085 was applied in wiping off expenditure on motor omnibuses. These accounts compared unfavourably with those of the previous year, when there was a surplus of £107,749, the decrease, therefore, amounting to £31,459. The falling off was mainly due to the frequent stoppages of the tramway services occasioned by the failure of the Electric Supply Department to maintain an adequate supply of current for the running of the cars.

PERSONAL.

Mr. P. H. Hurst has been appointed assistant to the county surveyor of Dublin, at a salary of £160 and war bonus.

Mr. A. H. Brain, surveyor to the Hursley Rural District Council, will take over the work of the Romsey Rural District Council, and thus release the Romsey surveyor (Mr. C. W. P. Dyson) for military service.

Mr. W. H. Wykes, surveyor to the Braxworth Rural District Council, has tendered his resignation as from September 30th next, owing to failing health. He has held the position for twenty-three years, and his resignation was accepted with regret by the council.

Mr. Samuel Robinson, assistant county surveyor of Antrim, has been appointed by the Larne Urban District Council to discharge the duties of surveyor till the end of the war, the council having decided, in fairness to the professional men serving in the army, not to make a permanent appointment at present.

Colonel A. S. Cooper, C.M.G., has been appointed Director of Inland Waterways and Docks, in succession to Major-General A. S. Collard, C.B., now Deputy Controller of Auxiliary Shipping, Admiralty. Colonel Cooper has had considerable experience in transport control. From October, 1912, he was general manager of the Railways of Nigeria, and for the past five months he has been in charge of the traffic branch of the Inland Waterways.

KILLED IN ACTION.

Mr. Hugh Scott, eldest son of Mr. H. H. Scott, borough surveyor of Hove, has, we regret to state, been killed in action. He was 34 years of age. After serving his articles in his father's office, young Scott became an assistant in the department. Subsequently he served two years with Messrs. Bramwell and Harris, civil engineers, of Great George-street,

THE LATE MR. HUGH SCOTT.

Westminster. Since 1909 he had been in private engineering practice with Mr. A. E. Blake (Messrs. Blake and Scott), at 5, Victoria-street, Westminster. He joined the Royal Engineers in 1916, and was afterwards transferred to the Northumberland Fusiliers. The sympathy extended to the borough surveyor of Hove in his son's loss will be no less deepened by the fact that his youngest son has been posted "missing" since March 1st.

Lieut. Leonard Tysoe, deputy borough surveyor of Hammersmith, has been killed in action. He was articled to Mr. W. H. White, city surveyor of Oxford, and served subsequently in the borough surveyors' offices at Richmond (Surrey) and Bermondsey. He had a wide circle of friends at Hammersmith, and his loss is deeply deplored by his colleagues.

OBITUARY.

Mr. A. James, borough surveyor of Kidderminster, who died last week, we regret to state, had been for about thirty-five years in the service of the town council, first as clerk and afterwards as surveyor.

Mr. Edwin Brown, surveyor and sanitary inspector to the Burgess Hill Urban District Council, died sud-

death last week, we regret to state, aged 64. His connection with dated back to the old Local Board in 1879 when Mr. Brown assisted in carrying out the sewerage and sewage disposal scheme under the direction of Mr. Bailey Denton. Mr. Brown devoted a great deal of attention to, and was highly successful in, the management of the sewage farm, and was also responsible for carrying out many public works, including the improvement of the paving of Burgess Hill.

The funeral of Mr. William Harpur, the late city engineer of Cardiff, which took place at the New Cemetery, Cardiff, last Friday, was attended by the Lord Mayor and Deputy-Lord Mayor, the ex-Lord Mayor, and nearly the whole of the members of the city council, and corporation officials, including the town clerk, and the deputy borough engineer (Mr. F. M. Greenhill). Others present included Mr. G. A. Phillips (county surveyor of Glamorgan), Mr. J. Holden (surveyor to the Llandaff Rural District Council), and Mr. T. Cole (general hon. and consulting secretary to the Institution of Municipal and County Engineers). The very large attendance of friends and representatives of professional and business interests was evidence of the high regard in which Mr. Harpur was held.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATIONS FOR LOANS.

Croydon T.C.—£2,000 for electric main extension.

Hebden Bridge U.D.C.—A further sum of £200 (making £3,700 in all) for extensions at the sewage works.

Woolwich B.C.—£2,088 for electrical machinery.

Worthing T.C.—£2,000 for the reconstruction of footways after the war.

Glasgow Tramways' Record Year.—Glasgow Corporation tramways have just completed a "record" year. The receipts were £1,245,507, an increase of over £96,000. The passengers carried numbered 388,250,000, or nearly 26,000,000 more than in the previous year. Nearly 248,000,000 passengers bought halfpenny tickets.

Building Licences.—With a view to removing misconceptions which have recently arisen in various parts of the country, the Minister of Munitions directs attention to the fact that no building or construction work costing over £500, or involving the use of constructional steel, can be undertaken without a licence from the Ministry. It is pointed out that such a licence is as necessary for work involved in the restoration of property destroyed or damaged by fire or aircraft as for work undertaken in other circumstances.

Port of London Workers' Houses.—The Port of London Authority have recently completed the erection on Garden City lines of 204 cottage residences designed for the rehousing of persons disturbed by the construction of the Royal Albert Dock Extension (South). The houses, which are situated on the Prince Regent's Lane estate, West Ham, are built in blocks of two or more, with gardens and open spaces at front and rear. The cottages have artistic frontages of various designs, and the internal accommodation is specially arranged to suit the needs of working class families. The fittings include bath, copper, gas cooking range, meat safe with outside ventilation, and wardrobe cupboards to bedrooms.

Derwent Valley Water.—Preliminary steps are being taken by the Derwent Valley Water Board to comply with the demands of Nottingham and Sheffield to be supplied with the full quota of water to which they are entitled within the next ten years. Nottingham, now taking 1,920,000 gallons daily, has a claim to 4,360,000 gallons in all, while Sheffield, already receiving 5,360,000 gallons daily, is entitled to 7,620,000. Neither of the other two towns, Derby and Leicester, sharing in the scheme intends at present to enforce its right to an increased supply. The deficiency to be met is thus 6,700,000 gallons daily, and the board have instructed their engineer to report as to the suitability of a site in the Ashop Valley for the construction of an additional reservoir of this capacity. The present supply to the four towns mentioned is 11,000,000 gallons daily.

REFUSE DISPOSAL AT SLOUGH.

By W. White Cooper,

Engineer and Surveyor to the Urban District Council.

[In the following statement Mr. Cooper summarises the results obtained from the destructor plant which he installed four years ago. The population of Slough is 17,000, its area 1,583 acres, and the rateable value £90,000. The district is mostly residential, and situate 18 miles from London. Local industries include Ellman's Embrocation, Horlick's Malted Milk, and Peters' & Co. Railway Carriage Equipments Works, and the quantity of refuse collected is 2,600 tons per year.]

The system of house refuse disposal is by means of sanitary dustbins. There are few ashpits and no privies. No nightsoil, fish, offal, or slaughterhouse waste is collected. Small quantities of trade refuse (paper) are collected for a nominal charge.

There is a weekly collection of refuse with the addition of two collections in congested areas. The council's own staff (except horses and drivers) do necessary work, and the council provide all the plant.

In 1912-13 the council, on the author's advice, put down a complete set in duplicate of Messrs. Goodrich and Hamlyn's patent low-grade fuel furnaces, to be worked either together or separately. The grate area of each cell is 6 ft. by 5 ft., each fitted with forced draught (superheated steam) apparatus. The firing and clinkering is done by hand. Each furnace is topped with a Babcock and Wilcox tubular boiler, 16 ft. long (area of heating surface 884 sq. ft., with a working pressure of 125 lb. Steam and water drain 48 in. diameter, 21 ft. 11in. long, 7-16 in. thick mild steel plates). In addition to the main and other flues a shaft 80 ft. in height (Custodis patent construction system) was erected.

The boilers are supplied with water by steam injectors or Davie Simplex boiler feed pump; the local water being very hard (30 deg.) it is treated by a Llassen and Hjort water softener.

The total cost of destructor, flues, destructor house complete in every detail, was £2,100.

The destructor works were opened for actual work in May, 1913, and are still giving every satisfaction in working and final results.

RESULTS SUMMARISED.

1. All refuse is effectually destroyed.
2. All steam required for the engine equalling 60-h.p. is raised from house refuse as fuel.
3. All waste products are economically turned into use.
4. The original costly coal account is wiped out.

STEAM OBTAINED FROM HOUSE REFUSE.

The whole of the refuse collected is deposited at the destructor works which are attached to the pumping station at the sewage outfall works. The whole of the sewage (average 4,000,000 to 5,000,000 gallons per week) is pumped from these works to the sewage farm by steam raised from house refuse.

The pump lift is about 36 ft., and the length of rising main 1¼ miles. In addition, there are three stations for Shone's ejectors, situate in different parts of the district. These are worked by compressed air obtained from the aforementioned pumping station. The greatest lift from the ejectors is 35 ft.

The sludge from the sewage-collecting tanks is removed three times a week by a centrifugal pump, and discharged to the sewage farm by a separate hydraulic main. There is also a steam disinfector at this station. The steam for the whole of this plant is raised without coal, in the Goodrich and Hamlyn patent low-grade fuel furnaces. Prior to this the cost of the coal at pre-war prices was £300 per annum, and to-day it would cost £600.

UTILISATION OF CLINKER, ETC.

The resultant clinker from the refuse burning is wholly utilised. After being crushed by steam road roller, and screened to requisite gauges, it is mixed with cement and manufactured into street paving, flags, kerbs, channels, blocks for construction of manholes, &c. Many miles of this material have been laid in Slough streets, at less cost than the ordinary manufactured articles.

The fine oxidised dust from the destructor flues is used as a basis for disinfectant powder, also as a top dressing on land for the destruction of wire-worms and slugs.

Tins, scrap-iron, bottles, &c., are sorted from the refuse and sold.

The economics, as stated, not only exceed the annual charges for interest and repayment of the loan on the undertaking, but utilise in every way what so many other people consider waste.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

ANNUAL SUMMER CONFERENCE.

The annual summer conference of the Association of Managers of Sewage Disposal Works will be held at Worcester on Saturday, July 7th.

PROGRAMME.

11 a.m.—Assemble at the Guildhall.

Dr. Sidney Barwise, B.SC., will deliver his presidential address.

Mr. Thos. Caink, ASSOC.M.INST.C.E., city engineer, will read a paper on "The Activated Sludge Process of Sewage Purification."

2 p.m.—Visit to the Worcester Sewage works to inspect the activated sludge installation in operation.

INSTITUTION OF WATER ENGINEERS.

SUMMER MEETING.

The annual summer meeting of the Institution of Water Engineers will be held in London on Friday, June 22nd, commencing at 2.15 p.m.

A paper entitled "Colour Records Applied to Potable Waters" will be presented by Mr. J. S. Pickering, M.INST.C.E., of Cheltenham (past president), and a discussion on "Water Supplies as Sources of Power" will be introduced by Mr. Cecil H. Roberts, M.INST.C.E., of Aberdeen (member of the council). The premiums awarded by the council for papers read during the year 1916 will be presented to the respective authors, and the president will read a short report on the past year's working.

Surveyors' Institution Examinations.—The military requirements of the country occasioned by the third year of the war were reflected in the number of candidates presenting themselves for examination by the Surveyors' Institution. If ten candidates who came up for re-examination in their typical subject are left out of the reckoning, it is necessary, the council point out in their annual report, to go back to 1887, only seven years after the examination system was adopted, to find a smaller total, the number for the year under review, sixty-three, being only one-twentieth of those who sat in the high-water mark year, 1913, when the total reached 1,266.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ARCHITECTURAL ASSISTANT.—June 11th.—Bedwellty Urban District Council. £150 a year.—Mr. T. J. Thomas, clerk, Council Offices, Bargoed.

SANITARY INSPECTOR.—June 11th.—Deptford Borough Council. Mr. A. Parker, town clerk, Town Hall, New Cross-road, London, S.E. 14.

FIRE BRIGADE MOTOR ENGINEER.—June 13th.—Eccles Town Council. £2 2s.-£2 5s. per week.—Mr. E. Parkes, town clerk, Town Hall, Eccles.

SURVEYOR AND INSPECTOR.—June 16th.—St. Ives (Cornwall) Town Council. £180 a year.—Mr. E. Boase, town clerk, St. Ives, Cornwall.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 18th.—Ulverston Urban District Council.—Mr. Fred. W. Poole, clerk, Council Offices, Ulverston, Lancs.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

DUBLIN.—June 11th.—For fitting up new offices for the city architect's department, for the corporation.—The City Architect, Municipal Buildings, Cork Hill, Dublin.

TOTTINGTON.—June 13th.—For building a retaining wall, for the urban district council.—Mr. L. Kenyon, surveyor, Chapel-street, Tottington, Lancs.

OAKWORTH.—June 20th.—For pulling down and rebuilding a boundary wall, for the urban district council.—The Surveyor, Council Offices, Oakworth, Yorks.

CHESHUNT.—June 26th.—For the erection of a small-pox hospital, comprising ward block, administration block, and laundry and mortuary block, for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor, Manor House, Cheshunt.

WILTS.—June 30th.—For alteration and repairs at schools, for the county council.—Mr. J. G. Powell, county surveyor, Trowbridge.

Engineering: Iron and Steel.

HIPPERHOLME.—June 12th.—For laying 666 yards of 6-in. water pipes, and supplying 28 tons of 6-in. tested cast-iron water pipes and specials, for the urban district council.—Mr. G. Wharton Thompson, engineer and surveyor, Council Offices, Hipperholme.

CHEADLE.—June 14th.—For the construction of a retaining bank and division banks at the sewage disposal works, for the urban district council.—Mr. F. D. Barton, surveyor, Council Offices, Cheadle, Cheshire.

KEIGHLEY.—June 18th.—For laying porcelain cable ducts and constructing manholes, for the corporation.—Mr. H. Webber, borough electrical engineer, Electricity Offices, Coney-lane, Keighley.

Roads.

BARTON-UPON-IRWELL.—June 16th.—For laying 590 superficial yards of 2½-in. concrete flags, for the rural district council.—Mr. A. H. Mountain, surveyor, Green-lane, Patricroft, Lancs.

ISLE OF WIGHT.—June 18th.—For team labour and the supply of road materials, for the rural district council.—Mr. H. E. Stratton, clerk, Council Offices, Pyle-street, Newport, I.W.

WELLINGBOROUGH.—June 19th.—For the supply of Leicestershire granite, best granite, chippings, best granite treated with bi-tarco, best hard limestone, best hard limestone chippings, patent paving slabs, best broken slag, best slag chippings, tarred slag, and stoneware pipes and gullies, for the urban district council.—Mr. J. T. Parker, clerk, 29, Church-street, Wellingborough.

CANNOCK.—June 29th.—For the reconstruction of the main road between Cannock and Hednesford, and other works in connection therewith, for the urban district council.—Mr. R. Blanchard, engineer and surveyor, Council Offices, Cannock.

Sanitary.

SEGHILL.—June 13th.—For the removal of ashes from the houses, for the urban district council.—Mr. T. Spencer, clerk, Seghill, Northumberland.

Stores.

KEIGHLEY.—June 12th.—For the supply of ironmongery, iron castings, pitch, broken limestone and granite, earthenware pipes and cement, for the corporation.—Borough Engineer, Town Hall, Keighley.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

WOOLWICH.—Accepted for the supply of materials, for the borough council.—Mr. J. Sutcliffe, borough engineer and surveyor.

Sewer Ironwork.—Needham & Sons, Limited.
Granite.—Groby Granite Company.
Tar.—Holmes & Co.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

9.—Institution of Municipal and County Engineers: West Midland District.—Visit to Worcester Sewage Works, 3 p.m.

21-22.—Incorporated Municipal Electrical Association: Annual Meeting.—Institution of Civil Engineers, Great George-street, S.W.

22.—Institution of Water Engineers: Summer Meeting in London.

28-30.—Institution of Municipal and County Engineers: Annual Meeting at Hastings.

20 Tramways and Light Railways Association: Annual Congress. Institution of Civil Engineers, Great George-street, Westminster. 2.30 p.m.

JULY.

7 Association of Managers of Sewage Disposal Works: Annual Summer Conference at Worcester.

APPOINTMENTS OPEN.

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BOROUGH OF HEMEL HEMPSTED.
BOROUGH SURVEYOR'S DEPARTMENT.

Applications are invited for the position of Assistant and Clerk from persons ineligible for military service, during the absence of man now serving with the Colours.

Salary according to experience.

WALTER R. LOCKE.
Borough Surveyor and Waterworks Engineer.

Town Hall,
Hemel Hempsted.
May 30, 1917. (3,423)

ULVERSTON URBAN DISTRICT COUNCIL.
TEMPORARY APPOINTMENT OF SURVEYOR AND INSPECTOR OF NUISANCES.

The above Council invite applications from persons ineligible for military service, experienced in and fully competent to perform the duties of the combined offices of Surveyor and Inspector of Nuisances.

The appointment may be for the duration of the War, and may be determined by one month's notice.

Candidates must be experienced in surveying, preparation of plans and estimates, road making, draining, sewerage work and sanitary matters, and all the duties pertaining to the work of a Surveyor, and be able to keep the prescribed accounts, and should hold the Certificate of the Royal Sanitary Institute or some other competent body recognised by the Local Government Board (the appointment of Inspector being subject to the approval of such Board).

The Inspector's duties will include those under the Public Health Acts, the Orders of the Local Government Board, the By-laws of the Council, the Factory and Workshop Act, the Housing and Town Planning Acts, &c., and generally to obey all the instructions of the Council and their Medical Officer of Health.

Applications, stating age, qualifications, full particulars of experience, present and previous employment, and salary required, together with copies of three recent testimonials, to be sent to the undersigned not later than 18th June, 1917.

FRED. W. POOLE,
Solicitor, Clerk to the Council.

Council Offices,
Ulverston.
June 4, 1917. (3,427)

TENDERS WANTED.

THE URBAN DISTRICT OF CHESHUNT.
SMALL-POX HOSPITAL.

The Council are prepared to receive Tenders from Firms who specialise in the construction of buildings of a temporary or a semi-temporary nature for the erection of a Small-pox Hospital, comprising Ward Block, Administration Block, and Laundry and Stationary Block.

Contractors are given the option of tendering for any form of construction which they may deem advisable, but the buildings and the accommodation to be provided must be in accordance with plans which have been prepared, copies of which, and also conditions and specification, may be obtained on application to the undersigned on depositing a sum of two guineas, which will be returned on receipt of a *bona-fide* Tender and not withdrawn, or on return of the documents.

Tenders must be deposited with the undersigned not later than 3 p.m. Tuesday, June 26th, 1917.

The Council do not bind themselves to accept the lowest or any Tender will not necessarily be accepted.

J. E. SHARPE,
Engineer and Surveyor to the Council.

Manor House Chambers,
June 5, 1917. (3,426)

HIPPERHOLME URBAN DISTRICT COUNCIL.

Tenders are invited for the following:—

1. The laying of 666 yards of 6-in. Water Pipes.
2. The supply of 28 tons of 6-in. tested Cast-iron Water Pipes and Specials.

Specifications and particulars from Engineer and Surveyor, Council Offices, Hipperholme.

Tenders to undersigned not later than Tuesday, the 12th June, 1917. The lowest or any Tender not necessarily accepted.

G. WHARTON THOMPSON,
Engineer and Surveyor.

Council Offices,
Hipperholme.
31st May, 1917. (3,422)

CANNOCK URBAN DISTRICT COUNCIL.
RECONSTRUCTION OF THE FOUNDATIONS OF THE MAIN ROAD AND CONCRETING AND PAVING OF THE STEEP GRADIENTS BETWEEN CANNOCK AND HEDNESFORD.

The above-mentioned Council are prepared to receive Tenders for the following works in connection with the reconstruction of the Main Road between Cannock and Hednesford, and other works in connection therewith.

Contract No. 1.—Reconstruction and Preparation of Foundations.

Contract No. 2.—Reconstruction and Preparation of Foundations.

Contract No. 3.—Reconstruction, comprising excavating, concreting, and paving of steep gradients.

Plans may be seen, and copies of the Conditions of Contract, Specifications, Bill of Quantities, with Form of Tender, &c., obtained on application to Robt. Blanchard, Engineer and Surveyor, Council Offices, Cannock, on payment of £2, which will be returned on receipt of a *bonâ-fide* Tender.

Cheques, &c., to be crossed and made payable to the Cannock Urban District Council.

Sealed Tenders on the forms supplied, filled up, and addressed to "The Chairman of the Cannock Urban District Council, Council Offices, Cannock," are to be delivered not later than Friday, June 29th, 1917, endorsed "Tender for Reconstruction of Road, Contract No. ——."

The Committee do not bind themselves to accept the lowest or any Tender.

C. A. LOXTON,
Clerk to the Council.

Council Offices,
Cannock.
26 May, 1917. (3,420)

APPOINTMENTS WANTED.

PREPAID *Advertisements under this heading are inserted at the rate of* ONE PENNY *per word, with a minimum charge of* 2*s.* THREE *consecutive insertions given for the price of* TWO.

CIVIL ENGINEER AND SURVEYOR, A.M.I.C.E. (ineligible), desires employment during war. Large experience Sanitation, Water Supply and General Construction.—Box 1,608, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. 4. (3,424)

PUBLICATIONS.

SURVEYING BOOKS AT TREMENDOUS REDUCTIONS. New Books at Discount Prices. Books on Surveying, Estimating, Building Construction and all other subjects supplied; sent on approval; state wants; send for lists; books purchased.—W. & G. Foyle, 121-123, Charing Cross-road, W.C. 2.

WILTON HOUSE HOTEL
PRIVATE AND RESIDENTIAL),
ST. LEONARDS-ON-SEA.
Visitors to the Annual Meeting of the Institution of Municipal and County Engineers to be held at Hastings, June 28-30, 1917, should book accommodation at this charming spot. Close to the Sea. Golf Links. Tennis Courts. Bowling Green. Croquet Lawns. Boating and Fishing.
Telephone and Telegraph 159 Hastings. Proprietors: Mr. and Mrs. I. Newton Moss.

The Surveyor

And Municipal and County Engineer.

Vol. LI. JUNE 15, 1917. No. 1,326.

Minutes of Proceedings.

Extraordinary Traffic and Road Repair.

It is sometimes a matter of considerable difficulty, when serious damage is done to a road by extraordinary traffic, extending over a long period, for the highway authority to decide as to the best method of dealing with the road. On the one hand it has to be remembered that their liability to keep the road in repair, as far as possible, is not suspended during the continuance of the traffic, and that if they omit to do what is reasonably practicable in that direction they run the risk of prejudicing their claim for extraordinary expenses, which may be rejected, or at all events reduced, on the ground that the damage is attributable, wholly or in part, to their neglect. On the other hand, they have carefully to guard against undertaking works involving what might possibly be regarded by the eye of the law as extravagant or unnecessary expenditure, which would be equally prejudicial to their claim. The charge of extravagance, indeed, is one not infrequently made in cases of contested claims, especially where the result of the repairs has been to improve the original character of the road, though it is true that that result is not necessarily, in itself, a proof of the charge. This much, at least, is clear from the following observations of Mr. Justice Lush in *Savin* v. *Oswestry Highway Board* (44 J.P., 766): "This road was apparently made for a much lighter kind of traffic, and sufficed for that traffic till the engines came to be used. The consequence has been that the Highway Board found it necessary to put the road into thorough repair, and this could not be done without reconstructing it in a better and more permanent manner. It is said that the road is now better than it ever was before. That has no doubt been the inevitable consequence of the damage done by the locomotives, and it seems that the board cannot sever the one cause of expenditure from the other. That is not their fault."

In this connection the unreported case of *Hertfordshire County Council* v. *Austin* (referred to in Mr. Barnard Lailey's excellent work, "The Law of Extraordinary Traffic on Highways") is instructive. In that case the traffic consisted of the cartage of building materials in connection with the erection of a lunatic asylum, such materials being conveyed in large contractors' carts, a string of which passed along the road almost daily for many months, outnumbering many times all other vehicles using the road, which at the time the traffic commenced was a narrow country lane, with grass wastes at the sides. The ordinary traffic consisted mainly of a few farm carts and wagons, for which the road was amply wide enough, and a thin coating of flint or gravel about every three years sufficed to keep it in repair. These contractors' carts, however, following one another in the same line, soon cut through the crust of the road, and then diverged on to the wastes, with the result that, in the course of a wet winter, road and wastes together were blended into an almost impassable swamp, in spite of all efforts to repair them with local materials. In these circumstances the council came to the conclusion that the only practicable method of adequately dealing with the road was to dig out the swamp and form a stronger road with a granite surface, increasing its width by taking in portions of the waste (so as to allow for two lines of traffic). This method was adopted accordingly, though it involved an expenditure many times more than had ever been spent during a similar period, either on the road in question or on an equal length of any neighbouring road of the same character. Needless to say, the defendant raised the plea of extravagance, and even went so far as to charge the council with trying to exploit the building of the asylum by obtaining an entirely different and far more costly road, at the expense of the building contractor. Fortunately for the council, however, this view of the matter was not accepted by the jury, who, after hearing the evidence of the council's surveyor, gave a verdict for the full amount of their claim, being over £1,000.

It will be noted that in this case no deduction was made from the amount of the claim on account of the "betterment" of the road. In a later case, however, Mr. Justice Jelf, having calculated the amount by which the extraordinary expenses exceeded the normal cost of repair, reduced it by one third, on the ground that, as a result of the repairs, the road had got a "new life," from which the council would derive benefit (*Kent County Council* v. *Kent Coal Concessions, Limited*, 72 J.P., 507). But, this decision notwithstanding, we venture to suggest that there is nothing in sec. 23 of the Highways and Locomotives Amendment Act, 1878, justifying such a deduction. What is recoverable under that sec-

[illegible] "the amount of such expenses as may be proved to the satisfaction of the Court . . . to have been incurred . . . by reason of the damage . . . to the road or traffic as aforesaid." Now, it seems obvious that no expenditure which can fairly be considered extravagant or excessive can be "expenses incurred by reason of" the damage in question, whether the road is thereby bettered or not. And conversely, surely, in the absence of extravagance, expenses may well have been incurred "by reason of the damage," none the less because the road may have been bettered thereby; and this view of the matter appears to be borne out by the above cited observations of Mr. Justice Lush in *Savin* v. *Oswestry Highway Board*. Nevertheless, having regard to the decision in *Kent County Council* v. *Kent Coal Concessions, Limited*, where there is any doubt as to the best way of dealing with a road, either during or after extraordinary traffic, the highway authority would be well advised to bear in mind the following suggestion of Mr. Bernard Lake's—viz., "It is a prudent thing to consult, at an early stage, the experts whom it is intended to call if a trial should take place, and let the road be dealt with as they and the plaintiff's surveyor, after inspecting it and discussing the matter together, consider desirable." Thus piloted they will, in all probability, be enabled to steer clear alike of the Scylla of "parsimony" and the Charybdis of "extravagance."

* * *

Geology and Engineering.

The application of the science of geology to practical engineering work is the theme of a very suggestive paper which Dr. Herbert Lapworth, M.INST.C.E., has contributed to the "Proceedings" of the Institution of Sanitary Engineers. There is perhaps no cause of dispute arising out of engineering contracts which occurs more frequently than some misapprehension as to the "nature of the ground." This is true in a very special degree of sanitary engineering work and water supply; and it is really surprising that engineers and contractors are so often satisfied with a few trial holes as evidence of the character of the works they are about to undertake. Without a sound training in field geology, however, it is difficult to judge with what accuracy or otherwise it is possible to anticipate from mere surface indications what may be met with geologically in excavations, or to know to what extent reliance may be placed upon deductions from borings or trial holes. The desirability of obtaining more accurate information, based upon expert scientific investigation, was urged by Sir Maurice Fitzmaurice in his address last year as president of the Institution of Civil Engineers. This applies more particularly to extensive works in which there is a possibility of meeting with difficulty from underground water. Hence Dr. Lapworth's plea for the more extensive and intelligent study of the science of hydro-geology. It may be said, indeed, that in the location of public water supplies and hydro-geology should go hand in hand, and Dr. Lapworth has rendered a valuable service in indicating a few of the main considerations to which these sciences are directly applicable to sanitary engineering practice. He deals in turn with the [illegible] of wells, testing the yield of existing wells, surface water supplies, [illegible] and tunnels, sewage irrigation areas, and sanitary work in colliery districts. In regard to surface water supplies, he points out that the world-wide [illegible] failures in the past are sufficient to show that something is radically wrong. Where the facts can be ascertained it is to be seen that the causes of failure are almost always of a clear and definite character, due primarily to geological difficulties, which in many instances might easily have been avoided by the application of quite an elementary knowledge of geology. In aqueduct and sewer trenches, too, there have been many similar avoidable failures, though, fortunately, usually on a smaller scale and with less fatal results. The greatest constructional difficulties in works of this class usually occur in clays, silts, muds, and running sands of alluvial, glacial and other recent origin. The problems arising in these materials frequently tax the engineer severely, not only in trench excavation work, but in modifying the design of the permanent work from time to time in order to meet the abnormal conditions. Further grave difficulties are added by the occurrence of ground water, which is liable to saturate the low-lying areas in which these unconsolidated deposits usually occur. It is evident therefore that here, too, there is need for practical geological knowledge on the part of the engineer—a knowledge which has a very real cash value. Another field for the application of geology that is of special interest to municipal engineers is that of sewage irrigation areas. Here not only is it essential that the subsoil should be of a porous, permeable and open nature, but accurate information is also required as to the depth and direction of flow of the underlying ground water. By means of this information it is possible to determine in what direction the effluent is likely to travel, and whether there is any possibility of pollution of local wells and springs. The right determination of these matters may well save an epidemic. It is to be hoped that the attention which is being called to the practical importance of applied geology by Dr. Lapworth and others may result in this subject taking a more important place in engineering education than has hitherto been the case.

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The Activated Sludge Process at Worcester.

On several occasions in the past we have referred in these columns to the desirability of publishing results of the operation of the activated sludge process of sewage treatment on a large scale and on the continuous method of working, and the opportunity for doing so has now arrived in connection with the meeting of the West Midland District of the Institution of Municipal and County Engineers which was held at Worcester last Saturday. It will be seen, from the particulars which are printed on another page, that the volume of sewage treated is large enough to justify the statement that the experiment is of a thoroughly practical nature. Incidentally it is interesting to note that the town where percolating filters with revolving sprinklers of the type in general use to-day were first adopted is the first to have a large installation of the most up-to-date and scientific system of sewage treatment in practical operation to-day, and by this means to be able to abandon the use of original percolating filters. Cathedral cities are generally considered to be a generation behind the times in many ways, but in the matter of sewage disposal the city of Worcester has taken the lead of all other towns in the country. This pre-eminence is undoubtedly due to the energy and far-sightedness of the city engineer, Mr. Thomas Caink, and it must be a source of considerable satisfaction to him to be able to point to the analyses of the effluent taken during the twelve months the new system has been in operation, which show 0·72 parts per 100,000 of solids in suspension and 0·56 parts per 100,000 oxygen absorbed in four hours on the average, especially when it is remembered that these highly satisfactory results are obtained by tank treatment alone,

without subsequent filtration. The principles of the system and advantages gained by its adoption were very neatly set forth by Mr. Pickering in his contribution to the discussion. After describing the "tremendous purifying effect that a large river had on organic matter," he pointed out that the new process is a highly scientific copy of what takes place in the river. In the latter the sludge contained in the sewage is "activated" by the dissolved oxygen in the river water, and the agitation required to bring the activated sludge into intimate contact with the organic matter in solution is provided by the movement of the river water. The only difference is that by means of the activated sludge process in tanks the excess sludge is kept back instead of being deposited on the bed of the river. Among the advantages Mr. Pickering mentioned particularly the "almost entire absence of offensive odour." This will be understood when it is remembered that the whole process is aerobic throughout. At no stage is it possible for septic action to occur when everything is working properly. This brings to mind several occasions in the past when we ventured to state, in opposition to the opinions of most experts of that time, that septic action or putrefaction is not an essential stage in the process of sewage purification. We certainly agree with Mr. Pickering in congratulating the contractors on the success that has been attained, especially as we gather from their statement that there is every probability that the cost of operation will be materially reduced when they have perfected their latest improvements in the method of delivering the compressed air into the sewage.

In connection with the question of cost of working it is too early to expect complete information, having regard to the fact that various alterations were made during the first half of the period of operation. The figure of 33s. per 1,000,000 gallons of the dry-weather flow for the compressed air alone is high for normal conditions, and, as already stated, it is anticipated that this will be reduced in the near future. But in the case of Worcester we gather that even with this figure a considerable saving has been effected, owing to the fact that the cost of pumping the sewage to the percolating filters is avoided, and the expense involved in the maintenance of the primary filters and distributors, amounting to £1,000 per annum, is saved. At the same time it is of the greatest importance that exact figures as to cost should be available, and all engineers engaged in sewage disposal work would be grateful to Mr. Caink if by this time next year he could supply full details of the cost of operation for twelve months. The value of these figures would be enhanced if they were set out under two headings—viz., "per 1,000,000 gallons dry-weather flow," and also "per head of population." They should also include all outgoings—such as total cost of compressed air for all purposes, wages, repairs and maintenance, as well as fixed charges, such as interest on and repayment of capital expenditure, based upon the cost which would have been incurred in constructing the existing tanks, together with the cost of the present new works. The cost of sludge disposal should also be included. Models of the manner in which financial details of this kind should be prepared are to be found in the annual reports upon sewage disposal published by some of the large towns, such as the cities of Manchester and Leeds. In conclusion, we are glad to note Mr. Caink's statement as to the efficiency of the porous plate type of air diffuser. Both here and in the United States many experiments have been carried out with various forms of nozzles as alternatives to the porous plates with varying success. It is interesting to learn that, while some trouble occurred with the porous plates when the "fill and draw" process was in operation, no difficulties were experienced when the tanks were operated on the continuous system.

* * *

Irish Municipal Undertakings and Borrowing Powers. A somewhat novel issue was raised recently with respect to the financing of municipal undertakings in an action heard in the Irish Courts, in which the Dundalk Urban District Council were plaintiffs. The council sought a declaration that, under the Public Health Acts and the Electric Lighting Acts the Local Government Board were entitled, if they thought fit, to grant a loan to provide working capital or working balance to enable the electricity undertaking in Dundalk to be carried on, wages to be paid, and other expenses to be met until the revenue could be collected. The council had entered into a contract to supply current for power and lighting to the Great Northern Railway Company, and for that purpose they had ordered two Diesel engines. But, owing to the war, the delivery of the engines had been delayed, and the council had been unable for one year to carry out the contract, thus causing a loss of £1,800 in revenue. To meet this, application was made to the Local Government Board for a loan of £2,000, and the reply was that the board had no power to sanction such a loan, as if was only for permanent works, and not for working capital, that a loan could be granted. How the council sought to make out their case does not appear from the report in the newspapers; but, however forcible and ingenious it may have been, it had no effect upon the result, for Mr. Justice Barton dismissed the application, which he said would in effect be asking him to disregard the prohibition of the statute which forbade borrowing for any purpose other than for permanent works, and to ignore the direction in the Provisional Order that any deficiency in income should be charged and payable out of rates. At the same time he admitted that municipal undertakings of this kind are at a disadvantage as regards working capital in comparison with commercial undertakings. It is obvious that the legal control of municipal undertakings must not only be full, but also strictly enforced; but it is equally clear that in such an instance as this the operations of public enterprise may be handicapped, or even seriously prejudiced, by an undiscriminating control which excludes special circumstances from its purview. It is satisfactory to have the opinion expressed from the bench that the action was fully justified, and that the *bonâ fides* of the urban council were not in question. It certainly does seem that in a case of this kind the municipal undertaking ought to have the same opportunities and liberty of action as an ordinary commercial enterprise.

State Assistance for Housing. Replying on Tuesday to a deputation from the Workmen's National Housing Council on the question of working-class housing, the President of the Local Government Board said it was clear that the Government had got to render financial assistance in the housing question, despite the many great obligations which the war had imposed upon it. He was afraid the most that could be done at present was to have the scheme in the main ready to be put into operation as soon as the war was over. The Government wanted the assistance of the local and other authorities in the matter and to ascertain how far they were prepared to come to the aid of the authorities in erecting the half-million of houses for the working-classes which would be required after the war. There must, however, be substantial national assistance towards the cost of erection.

The Activated Sludge Process at Worcester.

MUNICIPAL AND COUNTY ENGINEERS' INSPECTION OF WORKS.

In delightful weather the members of the West Midland District of the Institution of Municipal and County Engineers on Saturday last paid a visit to Worcester for the purpose of inspecting the activated sludge plant which has been in operation at the sewage works of that city for more than a year past. The visitors assembled at the Guildhall, where Mr. W. Sharpe, chairman of the Water and Sewerage Committee, extended a hearty welcome on behalf of the corporation, Mr. A. T. Davis (Salop County), the district chairman, returning thanks. The sewage works were reached shortly after three o'clock, and a considerable time was spent in examining the new plant, Mr. Caink explaining the operations in detail and replying to a host of questions that were put to him. On the conclusion of the inspection the members repaired to the engine-house, where, after the transaction of formal business—which included the re-election of the District Committee—Mr. Caink delivered an interesting address. Those present included, in addition to the district chairman, Mr. Davis, Messrs. J. D. Barrs (Bromyard), Robert Blanchard (Cannock), A. Burton (Stoke-on-Trent), W. A. H. Clarry (Sutton Coldfield), W. Fiddian (Stourbridge), C. F. Gettings (Worcester), A. R. Gray (Birmingham), A. D. Greatorex (West Bromwich), B. C. Hammond (Worcester), E. W. Jones (Stratford-upon-Avon), G. P. Mason (Walsall), R. C. Man (Nuneaton), T. H. Mawson (Market Rasen), Wm. Ransome (Worcester), J. S. Pickering (Cheltenham), Geo. Riley (Wellington, Salop), G. J. Shepherd (Kidderminster Rural), Henry E. Sutton (Birmingham), W. Osborne Thorp (Malvern), J. E. Willcox (Birmingham), and F. Woodward (Stourbridge). Among the visitors were Messrs. C. Dacey (Redditch), G. J. Edmundson (Stockport), Hugues L. Fellows (Lyn and Wollescote), Ernest Gaul (Manchester), Hy. Hulse (Droitwich), E. F. Mountjoy (Birmingham), J. R. Mudie (Birmingham), Geo. D. Price (Upton-on-Severn), and C. F. Walker (Worcester).

THE WORKS DESCRIBED.

Mr. Caink said he would like in the first place to express his personal appreciation of the compliment the members of the West Midland District had paid to the Worcester City by favouring them with this visit to their sewage works. He hoped the experimental plant which they had come to inspect would prove both interesting and useful. Mr. Caink proceeded: In the autumn of 1915 Messrs. Jones & Attwood, whose name among municipal engineers is well known, approached the corporation of Worcester with a desire to make use of one of the two sewage tanks here to experiment upon a somewhat large scale with the new process of sewage purification, to which the name of activated sludge process has been given, which was then in course of development. Dr. Fowler had seen the tanks and thought them extremely well adapted for the experiment. Arrangements were finally made with the city council for treating about one-half the city sewage upon terms which were embodied in an agreement between the company and the council. A portion of one of the two tanks was handed over to the company to make such alterations as they thought fit, and if the process were successful the plant would be taken over by the council at a price mentioned in the agreement. The process was to be regarded successful if, without causing any offence, the sewage at the rate of 750,000 gallons of dry-weather flow per day were so purified as to be incapable of putrefaction and not contain more than 4 parts per 100,000 of suspended matter. The question of what dissolved organic impurities the effluent contained was ignored, the purity being entirely determined by its power to resist putrefaction. If the process or the plant failed to fulfil these conditions continuously for a period of twelve months the company undertook to remove the plant and restore the tank to practically its former condition. No condition as to cost of the purification was imposed.

General View from Sewage Inlet Corner of Activated Sludge Tank Whilst Empty.

START OF EXPERIMENT.

The works were so far completed by April 25th of last year as to enable treatment to be started. It was, however, soon realised that some alterations would be necessary in order to produce the required results. Messrs. Jones and Attwood have been good enough to prepare cartoons to illustrate the plant as it is now operating. Before reaching these tanks the sewage is screened, and the heavy detritus removed by settlement in the pump well at the end of the engine house, and as it is lifted by centrifugal pumps, the sewage is fairly broken up before it gets to the tank. The tank is 18 ft. deep, and is divided

longitudinally into a series of narrow bays 8 ft. wide by 9 in. walls, all the bays being in water intercommunication. The floor of the first of these bays is formed into a series of ridges and furrows, which run transversely across it, the distance between the centres of furrows or ridges being about 5 ft. Along the furrows porous tiles 12 in. square are laid, through which air is blown from an air compressor fixed upon the covering of the pumping well.

THE AERATION PROCESS.

The effect of pumping air into the bottom of the liquid, as well as supplying oxygen to the organisms, is to produce a volcanic-like circulation of the liquid the stream of air forming the neck of the crater. In addition to this motion there is, of course, the forward motion due to the transmission of the sewage through the tank, the speed of which will, of course, depend upon the rate of flow, combined with the sectional area of the bay. When the liquid reaches the opposite end it enters the adjoining bay, and returns in a paralled line. The floor of this and of the succeeding aëration bays are constructed differently from that of the first bay. They are ridged and furrowed, but the distance between the centres is increased to about 10 ft., so that the spaces between the rows of diffusers are doubled, thereby reducing the quantity of air delivered to an equal volume of liquid.

In order to obtain with this arrangement of the floor the required velocity to prevent the settlement of sludge upon it, the air gives a rapid forward motion to the water which would carry it through the tank too fast for efficient aëration, or get checked at the settlement tank. To prevent this occurring a row of diffusers is placed at the ends of these bays at right angles to the others, so as to bring the liquid back, and cause a horizontal circulation between two contiguous bays. A similar device is adopted in the next pair—a part goes forward and a part returns. This device is very effective in producing the horizontal circulation around these pairs of bays.

The capacity of the portion of the tank devoted to aëration is such that it would hold a 10¼ hours' flow of sewage at the rate of 750,000 gallons per day, but assuming a volume of sludge of 25 per cent of the total the actual period of aëration at that rate is about eight hours. The tank which you have seen, including the portion at present unused, appears sufficient satisfactorily to treat an average sewage of a population of 25,000 persons with a water consumption of thirty gallons per head per day, with twice the dry weather flow. This affords an illustration of the very small space which the process requires. The quantity of air which is being pumped into the liquid, including that taken for raising the sludge, equals 0·8 cubic feet per gallon of sewage treated, and the consumption of electricity for compression is, with the machine now in use, 485 units per million gallons, which, at ¾ per unit, plus 10 per cent, which is the price paid for the current, amounts to 33s. per million gallons d.w.f. These units are equivalent to 27 elec. h.p. constantly running, or about 24 b.h.p. If any other source of power be employed, the cost will be increased or diminished proportionally to the cost of the power.

SETTLING TANK.

From the aëration tank the liquid passes to the settling tank. This tank consists of two pairs of bays, each bay forming a kind of Dortmund tank or inverted cone, whose sides slope at an angle of 60 deg. from the horizontal. Into one pair of these bays the water is conveyed along a channel at their ends, and into the other pair through cast iron pipes 15 inches diameter.

The purpose of the settling tank is to allow the sludge which is employed in the purification, and which is kept intimately mixed with the liquid by agitation through the air, to separate from the liquid by deposition at the bottom of the cones while the liquid decants itself off at the surface into a trough which conveys it to the effluent channel, from which it flows without further treatment direct to the river. The period of detention in the settling tank, at the rate of 750,000 gallons per day, is about 2¼ hours.

View from Same Point After Filling.

SLUDGE.

As the sludge which is deposited in the settling tank is essential to the process of purification, it is necessary to return it continuously to the aëration tank. This is done by means of air lifts, which consist simply of 6 in. cast iron pipes carried upwards from the bottom of the cones, with an air pipe carried down the centre of the larger pipe. Blowing in air produced a rapid current of liquid up the 6-inch pipe carrying with it the deposited sludge, which is discharged into the inlet channel which conveys the raw sewage with which it mixes on its way to the aëration tank.

In order to limit the accumulation of sludge in the aeration tank to the proportion determined upon, a

portion of it is more or less continuously drawn away. The sludge is very different. I understand that it contains up to 99 per cent. of water, but in addition to this a certain quantity of free water has to be removed by the settlers to ensure that the whole of the sludge is kept removed from the settling tanks, as otherwise it would become septic and foul the effluent. By means of these arrangements the process is enabled to proceed continuously, which obviously possesses an enormous advantage over the older "fill and draw" method.

DISPOSAL OF SLUDGE.

Unfortunately the process has not been running with sufficient continuity enough to enable the best method of disposing of the sludge to be determined, but, so far, it appears to me that the best method would be to run it on to the land on a firm, even surface having a very slight fall, so that it may spread out into a thin layer not more than an inch in thickness, and allow the free water from it to return to the sewer.

No offensive smell whatever has been observed

Looking Through Fifth Bay of Aeration Tank from Below.

from the sludge when spread out in this manner. It soon becomes stiff enough to handle, but if allowed to accumulate to any depth it holds the moisture very tenaciously. It is undoubtedly a good settler, but what money value to attach to it I am at present unable to state.

I have a number of analyses of the sewage and effluent. The latter contains no nitrogen as nitrates or nitrites, but with the Adeney test of dissolved atmospheric oxygen absorbed in five days the figure is satisfactory, and when the process is proceeding under normal conditions always shows no putrefaction in that period.

DISCUSSION.

A vote of thanks to Mr. Caink was proposed by Mr. J. E. Willcox (Birmingham).

Mr. W. Fiddian (Stourbridge), in seconding, inquired if any difficulty had arisen with the air diffusers or the walls. He gathered that some difficulty had been experienced in getting continuous diffusion. When such a thing did happen was there any simple way of overcoming it without stopping the whole process?

Mr. J. Bertram (Stockton-on-Tees) asked whether the Local Government Board and the river authorities were satisfied with what was being done. The cost of the air compression 3¾d. per million gallons dry-weather flow seemed rather high, and he should be glad to know whether the cost quoted for the electricity was for the compressors alone, or for the whole of the station and everything with it.

Mr. W. Osborne Thorpe (Malvern) asked what was the difference in the amount of sludge resulting from the process as compared with what remained previously. One would almost think that Mr. Caink had had the adoption of this process in view when the sewage works were designed, so admirably were the latter fitted for it; but there were probably situations where adaptation would not be so easy. What were the diffusers composed of? Also, having regard to the fact that wrought and cast iron was acted upon by sewage, was there not a risk of the arrangements for diffusion being upset by decay taking place in the pipes?

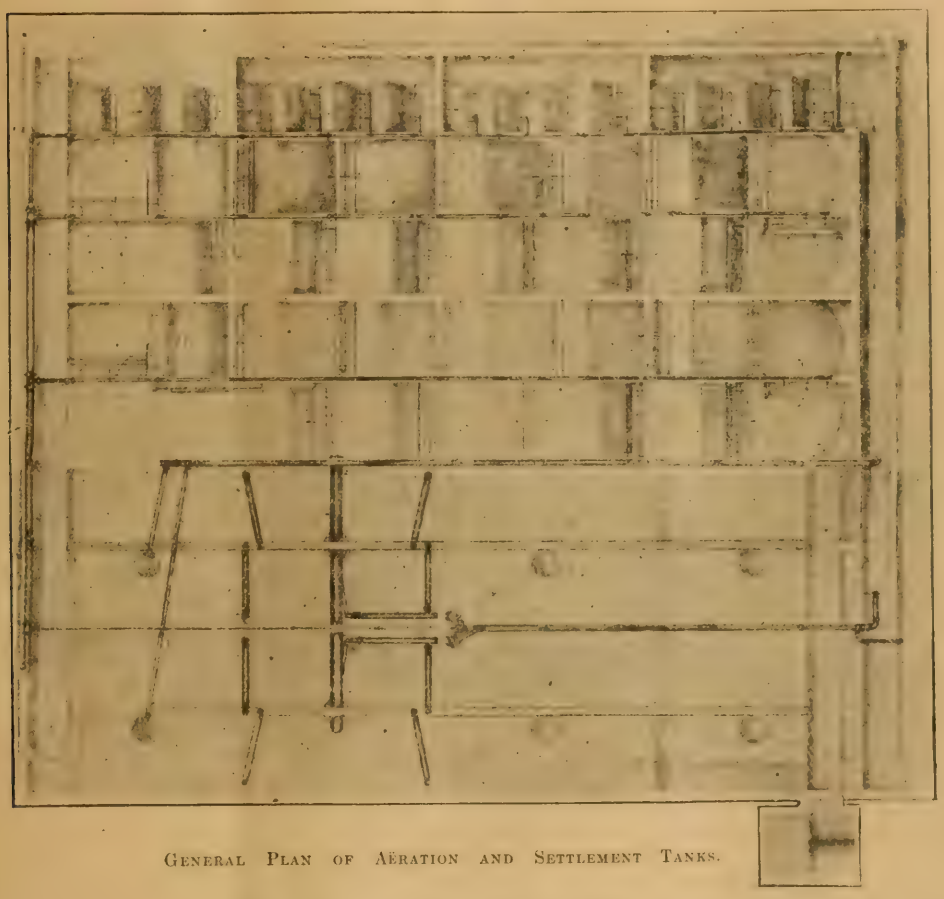
Mr. J. S. Pickering (Cheltenham) said Mr. Caink was to be congratulated on having induced his authority to carry out a scheme which showed every likelihood of being a great success. Worcester was faced with peculiar difficulties in the matter of its sewage disposal, but he thought they had now adopted a scheme which was going to be a satisfactory one. The water of Cheltenham was taken from the Severn, fifteen miles below Worcester, but it was an interesting fact that, notwithstanding the pollution to which it was subjected at Worcester, the river at Tewkesbury from a chemical point of view was quite as good as, if not better than, it was at Worcester. That showed the tremendous purifying effect that a large river had on organic matter. In the small compass of these works purification by this process had been copied in a very scientific manner, and he thought that when one worked on lines like these success was bound to follow. One was struck by the almost entire absence of offensive odour attending the process. There was no nuisance—no emptying of tanks; the whole thing was automatic. He thought as engineers they ought to congratulate the contractors on the success they had attained. When they started at Worcester the activated sludge process was in its infancy, and the fact that they adopted the very bold scheme of "no cure no pay" showed they had every confidence in what they could do. If they had not done so Worcester would not have had such an excellent scheme—the largest installation of the kind, he thought, either in this or any other country. The amount of sewage being treated by the process at Worcester showed that it had got beyond the experimental stage, and that they had arrived at the stage of practical treatment. There were, of course, numerous details to be improved, but these were more of a mechanical nature than anything else; so far as the bacteriological point of view was concerned there was no doubt that Mr. Caink and those interested in this process were working on the right lines.

Mr. E. G. Gaul (Manchester) thought it would be agreed that the activated sludge process was the coming method of sewage purification. Not only did it require a smaller area of land, but the cost was less. But the most important thing was that the sludge produced was not a troublesome one; moreover, owing to its qualities as a fertiliser, it was a thing to look after, and not to get rid of. Experiments which had been made had clearly demonstrated its superiority over the ordinary garden composts as a manure.

Mr. F. W. Jones (Stratford-on-Avon) asked what quantity of sludge was produced per million gallons. It seemed to him that if the sludge resulting from the process was worth so much money, it would be the greatest inducement to local authorities to convert their works.

The vote of thanks was passed, and Mr. Caink, in replying, said it had been a great pleasure to him to receive the institution, adding that he hoped that what they had seen and heard would prove both of interest and value to the members. Mr. Fiddian seemed concerned about the difficulty which might arise from the diffusers. From what he had learned, difficulties had occurred at various places, but they had experienced none at Worcester. When the works were first put down they were running it on the fill-and-draw process, and some of the diffusers gave some trouble, but with continuous working there had been no difficulties. Both the Local Government Board and the river authority had left them absolutely—he might say severely—alone. As to the suggestion that the cost of air compression was high, he realised from the first that the question became one of cheap

power, and he scarcely thought anything cheaper than electricity at ¼d. per unit was possible. But it, as he was hoping, the quantity of air required for aëration could be diminished, it might be that between now and next year the figure of 33s. per million gallons would be more than halved. He was unfortunately not in a position to state the quantity of sludge produced per million gallons of sewage, but in another two months' time he might be able to do so. Mr. Pickering had referred to the fact that Cheltenham drew its water from the Severn fifteen miles from the Worcester outfall. Probably that accounted for the popularity of Cheltenham. (Laughter.) He had been interested in the remarks of Mr. Gaul. He (Mr. Caink) had dressed his garden with sludge from the works, using the material at about the same rate as ordinary farmyard manure, and his potatoes were showing such extraordinary—he might almost say phenomenal—development that his only anxiety was to know whether they were all top and no bottom. (Laughter.)



General Plan of Aëration and Settlement Tanks.

Before leaving the works the members were entertained to tea by Mr. Sharpe, the Chairman of the Water and Sewerage Committee, the hospitality being acknowledged by Mr. Davis in a few well-chosen words.

ANALYSES AND WORKING RESULTS AT WORCESTER.

A pamphlet describing the works in greater detail than was attempted by Mr. Caink, and giving analyses and other results, was distributed at the meeting by the contractors, Messrs. Jones and Attwood. In this the firm mentioned that ever since Mr. Caink's attention was first called to the above process by Messrs. Ardern and Lockett's papers, he has exhibited a keen interest in it. As early as 1914 he conducted a deputation to Manchester and Salford to inspect their activated sludge plants, and was in communication with Messrs. Jones and Attwood on the same subject in December, 1914. In May, 1915, the company made suggestion for a small experimental plant in a tank of 10,000 gallons capacity (approximate) which proposal rapidly developed to a larger scheme in a tank of 500,000 gallons capacity.

The tank placed at their disposal was 80 ft. long by 72 ft. wide, made up in nine longitudinal bays each 8 ft. wide with 9-in. parting walls; these are again subdivided into compartments with 9-in. transverse walls. Of the nine bays, five are used for aëration and agitation and four adapted for settlement.

The five aëration bays are arranged as follows: The first bay, though 8 ft. broad at top, is only 5 ft. at bottom, due to batter of outside wall. The bottom of this first bay is arranged with ridges and furrows 5 ft. centre to centre; five air diffusers each 12 in. square were placed at the bottom of each furrow. The lower part of each transverse wall is cut away, making an opening 3 ft. deep right across tank above top of ridges, a ridge being arranged under each of these walls.

The other four aëration bays are arranged in pairs, each pair making a circulating tank. The bottoms of these circulating tanks are formed with ridges and furrows saw-tooth form at 10-ft. pitch with eight diffusers in each furrow. Advantage is taken of the transverse walls, which are used as baffles, and these together with intermediate baffles of wood give a baffle alongside each line of diffusers, which check the back flow and allow the rising current of sewage to flow forwards, thus giving a horizontal circulation of 100 ft. per minute velocity, a circulation much more rapid than would be obtained by the natural flow of the sewage through the tank. The objects of this intensive circulation are to prevent the deposition of sludge and to secure equality of its diffusion.

In order to make the best use of the four bays for settling the sludge and drawing off a clear effluent the aëration tank effluent was brought over a weir into a channel leading it to the end of the four bays, into which it flowed underneath a timber baffle about 8 ft. below the surface, the liquid having a horizontal flow for a length of 80 ft. over a floor area having a slope of 20 to 30 deg. from the horizontal, and then by flowing over the edge of and into a concrete channel. Light

stamps were [illegible] and fitted with 3-in. dia. air lifts to lift the settled sludge into the inlet channel.

AIR COMPRESSION AND DISTRIBUTION.

The air compressor, belt driven by electric motor capable of developing 40 b.h.p., is of the Ingersoll-Rand horizontal type which when running at 235 r.p.m. has a piston displacement of 615 cubic feet, and an actual delivery of 562 cubic feet, or a volumetric efficiency of 91·5 per cent at a pressure of 10 lb. per sq. in. according to maker's test.

The air main is 9 in. diameter from compressor to aëration tanks, branching into one 4-in. and two 5-in. pipes, running full length of tanks with a separate branch 3 in. diameter, reducing to 2 in. for air lifts. From the 5-in. and 4-in. diameter pipes the air is taken through wrought-iron galvanised pipes to the diffusers, set in the furrows of the aëration tank, and the air to each unit of two or three diffusers is controlled by a valve.

DIFFUSERS.

On the much-discussed question as to the use of porous tiles for diffusing the air, Messrs. Jones and [illegible] said:

"Before adopting the porous tile we tried some experiments with small orifices, but found they choked, whereas porous tiles were apparently not affected to nearly the same extent. Having decided on the use of porous material, we spent many months during 1913 and 1914 testing every porous material obtainable without securing anything suitable, and finally decided to make our own, and since we found a satisfactory composition early in 1915 we have had no trouble in obtaining the required porosity, whilst the sludge is not easily drawn into the pores of the tiles [illegible] when subject to the full hydraulic head of sewage in tank, the tile acting as a filter.

"[illegible] was found during some of the earlier experiments at Davyhulme in oil choking the underside of diffusers, due chiefly to the fact that air was drawn from high pressure sources, and the oil used had become carbonised, but if air is compressed to [illegible] per square inch, the temperature of compression is not sufficient to alter the nature of the oil and thus the liability to choke is small, provided the air compressed is clean. A little oil [illegible] pressure gauges, as we have found none. Our impression is that oil filters and traps [illegible] generally fixed at Worcester was removed after a few days' trial.

"The following advantages of the porous tile diffusers for circulation over mechanical agitation fully justify their adoption.

"(1) There are no moving parts in the sewage.

"(2) Compressed air is used for aëration, agitation, circulation and sludge lifting; one large power unit is more economical than several smaller ones.

"(3) The air used for aëration provides also for agitation and circulation.

"(4) The vertical and lateral circulation by numerous diffusers in a ridge and furrow tank is more effective than any form of mechanical circulation. The sludge by means of the sloped bottom gravitates on to a diffuser, where it meets with an upward current of air and water and is carried rapidly to the top surface of the liquid, from which it falls slowly, to be again carried to the surface. These numerous vertical whirlpools ensure the whole of the sewage being equally treated.

"(5) In most cases where compressed air is used all the heat of compression is lost, and only a portion of the potential energy in the cold air is obtained in useful work. In the use of compressed air for agitation and circulation the whole of the energy contained in the air is given back.

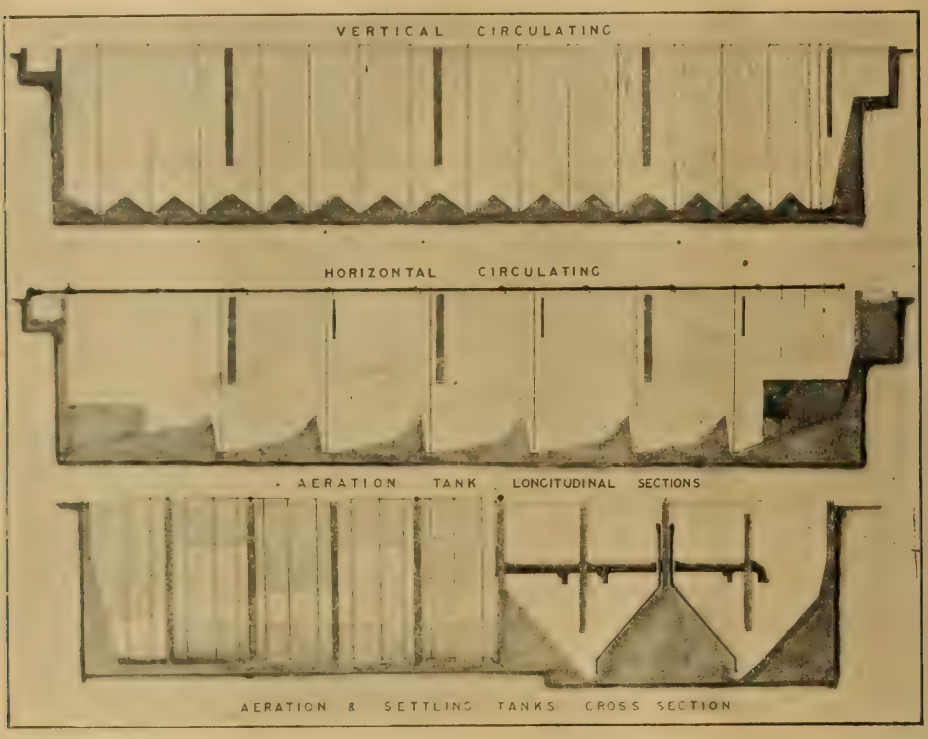
"The reasons for this almost ideal efficiency of compressed air when used for aëration are:

"(a) There is no back pressure, as the air 'escapes' at surface of sewage at atmospheric pressure.

"(b) The energy in the air is used to produce motion in the liquid, and is therefore equivalent to the heat generated by that motion. Again, the work of the air expanding extracts an exact equivalent in heat from the liquid. Thus the two effects neutralise each other.

"We reasoned that if air lifts are as economical as mechanical mixers, then the use of air both for mixing and aëration must make the air lift more economical. We therefore concentrated our attention in devising the most economical method of agitating by air lifts, and the outcome was the diffuser arranged in furrows. It is interesting to find our reasoning has been borne out in practice, and that diffusers are being adopted almost without exception in the activated sludge process.

"Experience has proved that jets with holes of from 1-32 to 1-16 are at a disadvantage compared with diffusers, as they require several times the volume of air to give equal results in treatment."



Sections of Aëration and Settlement Tanks.

PURIFICATION OBTAINED.

The average of nine samples of screened sewage taken and analysed by the Worcester city analyst between July, 1916, and 19th May, 1917, gave the following results in parts per 100,000.

Solids in suspension	14·3
,, solution	128·8
Albuminoid ammonia	·76
Oxygen absorbed in 4 hours...	3·7

Since November, however, the more dilute sewage from the St. John's district has been omitted, and a snap sample taken on 22nd May last of Worcester city sewage showed the oxygen absorbed figure to be as high as 9·74 and the albuminoid ammonia 1·48 parts.

The following are results of analyses taken by the Worcester city analyst of samples of final effluent,

— Foam on Aeration Tank Due to Aeration.

which fairly represent the process in operation during the last twelve months, the average volume of sewage treated per day being 757,000 gallons: —

Table No. 1.—Parts per 100,000.

Date.	Sample.	Solids in Suspension.	Albuminoid Ammonia	Oxygen absorbed in 4 hours
1916				
June 9	Snap	Nil	·13	·4
,, 19	,,	,,	·15	·4
,, 20	,,	1·2	·13	·5
July 4	24 hrs.	3·8	·13	·8
,, 6	Snap	1·0	·13	·4
,, 14	24 hrs.	1·2	·17	·5
,, 19	,,	Nil	·1	·6
,, 27	,,	1·0	·2	·6
Oct. 17	,,	Nil	·12	·7
Nov. 22	,,	Nil	·16	·8
,, 27	,,	Nil	·07	·1
1917				
May 18	,,	·4	·21	·5
	Average	·72	·14	·56

The sludge in aëration tank on the above dates averaged 19 per cent as measured in a glass cylinder after one hour's settlement. Only two samples of effluent taken during the last twelve months showed any putrefaction after five days, and these were taken last October, and contained large proportions of sludge, which was not settled out until the tankage was increased.

RUNNING COSTS.

In order to give the necessary agitation it was found possible to reduce the compressor speed to 160 r.p.m., giving a free air delivery of 384 cub. ft. per minute at an absorption of 20 b.h.p. The surface area of aëration tank is 3,280 square feet; hence seven cubic feet of air is used per square foot of tank surface per hour, including that used by air lifts. Readings, confirmed by Mr. Lamb, the sewage works manager, show that the electric motor absorbs 16 units per hour at ¾d. per unit, equal 1s. per hour for power; hence the greater the volume of sewage treated (which will depend upon the strength of the sewage) the less the cost per million gallons. This would follow in a sliding scale as shown in Table 2.

The average b.h.p. for lifting the sewage from present tanks at Worcester into the tower (for distribution on filters by means of the pipe arm distributors) was 25 b.h.p. per million gallons, but this lift is now unnecessary and its cost is entirely saved. Thus when treating 1,500,000 gallons (240,000 cubic feet) per day with 20 b.h.p. (14 b.h.p. per million gallons) there is a saving in electricity for working plant of 44 per cent, the maintenance of the distributors and primary filters amounting to £1,100 per annum is saved, also that of the sand filters, and a better effluent is obtained.

Table No. 2.

Rate of flow per 24 hours.		Electrical units used, and cost per hour.		Cost per 1,000,000 Imperial gallons at ¾d. per unit.
Imperial gallons.	Cubic feet.	Units.	Cost	
				£ s. d.
750,000	120,000	16	1s.	1 12 6
1,000,000	160,000	,,	,,	1 4 0
1,250,000	200,000	,,	,,	19 3
1,500,000	240,000	,,	,,	16 0
1,750,000	280,000	,,	,,	13 9
2,000,000	320,000	,,	,,	12 0

The volume treated up to date has varied from 500,000 to 1,500,000, but Messrs. Jones & Attwood are of opinion that a still larger volume can be treated efficiently, in which case the cost per 1,000,000 gallons would be proportionately reduced.

TEMPERATURES.

Judging from the records of the temperature and effluent taken during last March, it would appear that cold weather does not affect the character of the effluent materially, and that there is reason to

expect that the process will be found more suitable than exposed trickling filters for cold climates.

PULSATING GEAR.

Under this heading Messrs. Jones and Attwood say:

"Since the plant at Worcester was designed we have brought out an important improvement in the method of applying the compressed air. Our patent pulsating gear applies the air in intermittent puffs, and this has been tested at the Manchester Sewage Works, Davyhulme, and shows a reduction in the volume of air required of about 50 per cent. The pulsating valves are of simple mushroom type, each operated by a pressure diaphragm receiving its air pressure intermittently from one of a series of pilot valves, the series being operated from a cam shaft, which is turned by an air wheel immersed in oil. Each pilot valve controls the air to a definite section of the aeration tank. There may be two or more sections. If there are six sections, then one is being blown vigorously for, say, five seconds. During the five seconds the sewage and sludge in this section are thoroughly agitated, so that even the heaviest sludge is blown to the surface, and this being repeated every 30 seconds keeps the liquid and sludge in constant circulation.

"This intermittent blowing has other advantages. The concentration of the air on a smaller number of diffusers brings a larger number of the small pores of each diffuser into commission, thus keeping them open and dividing the air used into a larger number of small bubbles. If during the puff twice the amount of air is blown through a section of diffusers, yet with six sections only one-third the total volume of air is required that would be used blowing continuously.

"Intermittent blowing at frequent intervals of lines of diffusers interspersed throughout the tank ensures a better general circulation, and at the same time prevents any local action. This effect is greatly increased by using a sufficient volume of air to compel any deposited sludge to be carried up to the surface. Sludge thus raised travels for a short distance over the surface, and then gradually falls, depositing on another set of diffusers not blowing at the time, from which it is again raised to the surface. This intermittent action operates in a cycle of about 30 seconds duration."

ELECTRICAL POWER COMMITTEE.

INCREASED REPRESENTATION OF LOCAL AUTHORITIES.

In the House of Commons the President of the Board of Trade was asked whether he had received from local authorities any protests with regard to the insufficient representation of such authorities on the Committee he had appointed to consider and report on the supply of electrical power in the United Kingdom, and whether, having regard to the part taken by municipalities in the supply of electrical power, he would give increased representation on the Committee to the local authorities?

Mr. G. Roberts said the Board of Trade had received from local authorities complaints that they were insufficiently represented on the Committee, and had decided to increase their representation.

Bootle Tramways Maintenance Agreement.—At their last meeting Bootle Town Council went into committee with regard to the proceedings of a special committee with reference to the repair and maintenance of the Bootle tramways by the Liverpool Corporation. It was decided to confirm the committee's minutes, which included the entering into a fresh agreement for a period of twenty-five years from July 1st with the Liverpool Corporation for the repair and maintenance of the Bootle tracks. The agreement provides that Liverpool shall pay a rental of £500 a year for the first six years, and £1,000 a year for the remainder of the period for the use of the tramway tracks. The Liverpool Corporation shall be responsible for the upkeep of the rails and paving within the tramway limits, the Bootle Corporation to do the final reinstatement work. With regard to the proposed agreement the Liverpool Corporation are to allow Bootle a sum of £4,000 per mile for motors and the equipment to be leased over to Bootle at the end of the period [illegible] Bootle Corporation

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is not Dr. Houston to be very heartily congratulated on the eleventh report which he recently presented to the Metropolitan Water Board? Does it not bristle with useful information, gathered from long and careful experiments, upon the proper purification and sterilisation of potable water, and is not this report, and all those which preceded it, of the greatest value to water engineers throughout the world? Is it not satisfactory to find that the Water Board were large-minded enough to allow the continuance of these investigations and reports during the war, instead of suspending them, as at one time was rumoured, on the ground of a petty economy?

. . . .

Is there not a considerable amount of truth in the suggestion made by one of the contributors to Mr. Rees Jeffreys' excellent paper on Town Planning, that one of the chief reasons why more schemes have not been prepared by local authorities is the enormous amount of work thrown on the surveyor in the preparation and carrying out of such schemes —for which he receives no special pay? Is it not the hope of reward that sweetens labour, and is not the pay of municipal surveyors notoriously inadequate for the amount of work they perform?

. . . .

With reference to Mr. J. D. Haworth's letter in The Surveyor of June 8th, as to extraordinary traffic by timber haulage for the Government causing great damage to rural roads, are there not several instances in which the War Office or the Ministry of Munitions have paid the entire cost of reinstating roads on which damage has been caused by concentrated or damaging traffic?

. . . .

Is it not a brilliant example of what municipal authorities can do in the way of saving when we read that at Bromley, Kent, the systematic collection of waste paper, started only two months ago, has resulted in a weekly profit of £78, equal to a halfpenny rate over the district? Is not the Mayor, Mr. Lindley-Jones, to be congratulated on organising this excellent war saving movement, and to be felicitated on the success which has followed his excellent conception?

. . . .

Is it a fact that the University of London are about to institute a B.Sc. degree in estate management? If this is so, are there not a number of architect surveyors who manage large corporation estates who will readily avail themselves of the opportunity to add such a distinguishing mark of knowledge to their titles? Shall we not all look forward with considerable interest to see upon what lines and subjects and upon what circumstances the examination will be based?

. . . .

A question has arisen as to whether it is lawful, or usual, to lend to a third party plans which have been deposited in the usual manner with a building surveyor. Has it not often been a matter of contention as to whether plans so deposited with the local authority belong to the local authority, the architect who deposits them, or to the architect's client? Do they not legally belong to the last-mentioned, as they are merely "deposited" as a reference, under Sec. 157 of the Public Health Act, 1875?

. . . .

Has not the rather vexed question as to whether deforestation of large areas of land affects the regular run-off of rain water from the soil been considerably helped by the "Note" recently issued by Mr. Hill, the Chief Conservator of Forests, Central Provinces, India? Does not this "Note" clearly show that, after a long-continued study of the district in question, forest denudations are injurious to regulated stream flow, and consequently that the planting of trees on catchment areas is to be encouraged?

. . . .

Is it not interesting to learn that Sir Noel Kershaw, Under Secretary of the Local Government Board, and his colleagues, who have been in India for several months, have completed their investigations as to the working of the Public Works Department, and are shortly returning to England? Is it not to be hoped that their report will be published as a Parliamentary paper, as such a report is likely to contain valuable information as to the working and procedure of local self-government?

Institution of Municipal Engineers.

GENERAL MEETING IN LONDON: THE VALUE AND POSSIBILITIES OF HOUSE REFUSE.

A general meeting of the Institution of Municipal Engineers was held on Wednesday evening, the 6th inst., at Southampton row, W.C., when a paper was read by Mr. Reginald Brown, M.INST.C.E., on "House Refuse: Its Calorific Value and its Possibilities." The chair was taken by Mr. C. Adams, M.INST.C.E., acting-president of the institution, and the attendance included Messrs. P. C. Gupta (London), A. Elson (Penge), Horace Boot (London), D. C. Fidler (Hayes), W. E. Woolley (Walthamstow), F. A. Pratley (Epsom), H. Battam (Finsbury), A. W. Lawson (London), C. Chambers Smith (London), G. P. Pratt, A.R.I.B.A. (Acton), T. Mundy (Woolwich), T. Puzey (London), and B. Wyand, secretary.

Mr. BROWN, having read his paper (which appears elsewhere in this issue), explained that he had suggested to the Government that they should make use of his method of treating the waste in camps by converting it into fuel for the use of the camps. After considerable trouble and negotiation, and questions having been asked in the House of Commons, he received a letter authorising him to visit a camp and inspect the method for the disposal of refuse "by means of incineration." He regarded such a letter as an insult, and replied that he did not want to waste his time upon such a visit. The matter, he added, did not rest there, for there would be further questions in the House of Commons with respect to it. He mentioned these facts to show the difficulties that had to be faced to get over ultra-conservatism with respect to new ideas in this country.

The CHAIRMAN, in moving a vote of thanks to Mr. Brown for his paper, said the crux of the matter was its financial aspect. Whereas municipal authorities had to pay from 3s. 9d. to 5s. per ton to get rid of the refuse, if they would only treat it as Mr. Brown suggested they would get rid of it and have a margin of 3s. to 4s. per ton. Mr. Brown stated that the fuel could be manufactured for 7s. 6d. per ton. That, he (the speaker) took it, included all the sinking fund and other charges. As regarded the calorific value, how was this arrived at? House refuse had manurial and calorific value. In looking at the "composition" table, he saw that the only items which covered manurial value were paper, straw, &c., and bone. He would like to know whether those who advocated house refuse for manurial purposes agreed that these articles represented the manurial value. If so, well and good; it left the balance for combustible purposes. Of paper and straw the calorific value was small when their bulk was considered, and bulk was an important matter. Then there was the question whether, in the majority of towns, the calorific or manurial value of the refuse was greatest. The figure quoted by Mr. Brown (one-fifth the value of coal) referred to untreated refuse, and it was proposed to impregnate it with tar-pitch, which would no doubt greatly increase the value of the refuse. It would increase its combustibility, at all events, but whether it would have a material effect in increasing its calorific value was an important question.

Mr. HORACE BOOT (London) remarked that his experience was that instead of attempting to get local authorities to take up new ideas it was far better to let private enterprise start them, after which, if they were successful, local authorities would be able to get statutory powers for adopting them. With respect to the trouble Mr. Brown had had with the Government, they were entitled to remember that it was war-time, when untried schemes could not be adopted. The question of tar and other oils had given the utmost trouble to the Government. They could not get enough of them for war purposes, and when oils were £8, £10, and £12 per ton it would be difficult to induce them to allow oil to be used for the purpose proposed by Mr. Brown. The acting-president had asked what was the actual cost of the fuel produced by Mr. Brown, and how was the cost made out. With respect to the refuse, there would have to be large collecting places, and in its untreated state it might cause some nuisance. Then there was the question of chemically treating it. There was no doubt that the tar oil would add considerably to the calorific value of the refuse. But perhaps the best way would be to consider the calorific value alone, without the addition of tar oil. Destructors were the only sanitary method of dealing with refuse, as tipping, barging or carting were too costly. Some time ago he made a calculation of the average amount of steam produced in London by destructors, and he found that in ten districts the actual pounds of steam generated by refuse represented 1·1 lb. of steam for 1 ton of refuse. Thirteen provincial towns showed 1·2 lb. If this was being wasted, it should not be if they considered what it could be used for waterworks, electricity works, stone works, &c. The difficulty had been to dispose of the clinker in large quantities, and the cost increased as the quantity increased. As a matter of fact, the improvement of destructors had not advanced as it should have done, due in part to the opposition of local authorities to spend money on improvements. Mr. Brown solved the problem by making the refuse into briquettes. It would, he thought, be an advantage if thermal storage was adopted, for the knowledge of preventing explosions, which formerly occurred, had advanced considerably. In 1898 the dust collection of London represented 1,000,000 tons per annum, and if the improvements he alluded to were introduced a great saving would be effected. At the same time he should like to see Mr. Brown's balance-sheet of the cost of producing his material. There was the cost of carting, of grinding mills, of chemicals, and of the tar oil. If this was given, and on the other side was stated the value of the briquettes compared with coal, it would be possible to judge the financial bearing of the matter. Mr. Brown, he noticed, gave an evaporation of 2·46 lb. of water, but it had been found that refuse did not evaporate anything so high as that in actual practice. There were a good many reasons why public authorities did not always view destructors with satisfaction, and the principal was that people were afraid a district would be spoiled by the prevalence of fine dust or the smell from the tips before the refuse was burned. In Shoreditch and other areas this had been proved to be more or less a fallacy, and it was largely due to the fact that surveyors had not pushed the destructor before their councils as they might have done that there were not more destructors. They had to satisfy people of the sanitary efficiency of the process. If there were constructed a lot of works on a small scale there might be no difficulty, but the moment manufacturing was begun on a large scale the difficulty would commence. Grinding machinery was expensive to run, and to make the fuel pay would necessitate a large mill to which a number of authorities could deliver their refuse. As to the question of "statutory authority," to which Mr. Brown had referred, he had found out what they had all found out—that you could not get the central authority to grant a loan until it was proved that the process suggested was a success, and this would have to be proved by private enterprise. They wished Mr. Brown unqualified success and admired his enterprise, and it was to be hoped that the success of the process would be proved on a small scale to enable the local authorities to take it up as soon as the war was over.

Mr. G. P. PRATT (Acton) said he would like to know what size of plant would be necessary to deal with 11,000 or 12,000 tons per annum, which was about the average amount of refuse they had to deal with at Acton. It appeared to him that in the event of a loan being refused the local authority could meet the cost of a scheme out of the current rates.

Mr. T. MUNDY (Woolwich) said he was interested to know what percentage of vegetable matter would be in the refuse the briquettes were made from. At Woolwich they dealt with 20,000 or 30,000 tons of refuse a year, and they did not get much credit for what they burned; in fact, they had plenty of material which they had no opportunity of disposing of, though the war, having brought many works in its train, had enabled them to dispose of the clinker with some success. If they could carry out a system of disposing of the refuse in the way suggested by Mr. Brown it would be a good thing, though at the same time he thought destructors were necessary for effective trade refuse. There were various things such as cartage, sorting, and the clearing of the destructor cells from metal, which must be taken into consideration in estimating the cost of the briquettes. He noticed that Mr. Brown quoted twelve to the percentage of paper, straw, and fibrous and vegetable matter in the refuse, which seemed to him (Mr. Mundy) to

to very small interest, considering the materials that had to be dealt with. If the process was practicable it seemed to him remarkable in a way that it had not been put in operation years ago, for it appeared to be a very sanitary way of disposing of a town's refuse. Still, as he had said, they would always want a destructor for the disposal of material that could not be made use of for the manufacture of the briquettes.

Mr. Brown, in replying to the discussion, said he agreed with the acting-president that this was entirely a financial question. Finance was the crux of the whole matter, giving, of course, consideration also to the sanitary aspect. He had stated that the fuel could be manufactured at 7s. 6d. per ton, and he also stated that the cost depended upon the cost of the reinforcement of the material. The 7s. 6d. was made up of these figures: Cost of building, 1s. per ton; capital and repayment of principal and interest, 1s.; cost of crushing, including sorting and repairs to machinery, anything between 1s. 6d. and 2s.; briquetting, 10d.; impregnation-tars and the cost of reinforcement, 3s. What else was there? If they could tell him anything else besides the royalty he would be glad to hear of it. He agreed that destructors would still be required for certain things, but it need be only a destructor on a very modified form. The £1,500 which he suggested would deal with twenty tons a day, and no destructor could be put down for £1,500 to deal with twenty tons per day. As to the relative calorific and manurial value of town refuse, there was a great deal of difference in various places. His estimate of the value of the briquette was one-fifth the value of coal, but he really thought it was one-fourth. The large percentage of moisture in house refuse went a long way to reducing its value. His plan was to remove the moisture by exposure to the ordinary atmosphere—there was no treatment whatever required in this respect. In a dry climate the drying would take one day, and in the more humid areas it would probably take two days. The true calorific value of any kind of fuel could only be accurately stated by a correct analysis. The values in the tables were not his values at all—he put them forward as a basis for discussion. As to thermal storage, that was a means to an end, and he thought there was a great future for it if developed on right lines. Mr. Brown proceeded to argue in favour of the co-ordination of dust collection, and said the remedy for the present costly system was government by community and not by boundaries. As to the remarks of Mr. Mundy, he had to say that he did not know the percentage of vegetable matter in the blocks, but it might be 10 per cent in winter and 50 per cent in summer. He was in favour of converting fish and butchers' offal into manure. With reference to the suggestion of Mr. Boot that the process should first be made a commercial success, and then adopted by local authorities, he might say that this could not be done at present, as he could not obtain official authority to get a single bit of the necessary machinery.

County Roadmen's Duties.—Liskeard, Cornwall, Rural District Council on Saturday raised the maximum wage for roadmen to 24s. per week. Mr. P. G. Brown protested against the action of the county council in connection with the employment of men on the main roads which had resulted in the district council losing the foreman in one parish. Instead of each having 6 miles of road to look after, the distance had been reduced by 2 miles, with a half-day holiday a week. He understood that all the men were required to do was to trim hedges and similar work. Stone-breaking was included in their duties when the district councils had charge of the main roads.

Locomotives on Highways.—As a temporary war measure, the Local Government Board have issued an order known as the Locomotives on Highways (Agricultural Locomotives,' No. II.) Regulations, 1917, which provides that where the driving wheels of an agricultural locomotive not exceeding five tons in weight are shod with diagonal cross-bars, and the cross-bars do not exceed in thickness the limit of [illegible] as are prescribed by Section 28 (4) of the Highways and Locomotives (Amendment) Act, 1878, it shall not be necessary to comply with the requirements of that section with regard to the width or extent of the cross-bars nor with regard to the width of the space intervening between each such cross-bar.

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ

(One man does not see everything.)

—Euripides.

A WEST COUNTRY APPOINTMENT.

To the Editor of The Surveyor.

Sir,—Looking down a long list of vacant appointments this morning I noticed a West Cornwall corporation offering the position of surveyor and inspector of nuisances for their borough for the magnificent salary of less than £3 10s. per week, Sundays included, for, it is stated further on, that the official must devote the whole of his time to the service of the council.

I had a sort of idea that a person with the necessary qualifications for such an appointment ought to be a man of some brains and education. But I suppose I must have formed too high an estimate of the accomplishments for such a position, and that they can be assessed at a pretty low figure from a monetary point of view is evidenced by the advertisement referred to.

Even a taxi or steam-lorry driver gets more than that to-day, and the average handyman can at least reckon on something like 8s. per day, with no appearance to maintain, no years of training without salary to serve, nor expenses of qualifying exams. to incur.

A report of the meeting of the council does not state the reason for the present surveyor leaving; if he had tendered his resignation it would have excited no surprise. The simple wonder is that any man who, "in addition to the ordinary duties of the appointment," as the advertisement facetiously has it, has the zeal and ability "to manage and supervise the waterworks of the corporation" and "to devote his whole time to the council's service," could ever be found willing to part with it for so paltry a weekly wage as 69s.?

Yet I suppose there will be a whole shoal of applicants for the unenviable position of surveyor and inspector to the St. Ives Corporation; some, perhaps, in the hope of its speedily leading to something better; others, possibly, with the idea that something more can be got out of the post than the mere salary offered. I don't envy the successful applicant anyhow, whatever his sense of the fitness of things may be.—Yours, &c.,

Civitas Oxonunsis.

June 13, 1917.

DAMAGE TO ROADS BY TIMBER HAULAGE.

To the Editor of The Surveyor.

Sir,—I have been much interested in the letter by Mr. James D. Haworth appearing in the current issue of "The Surveyor," and with your editorial remarks thereupon. From what one observes from time to time in your paper, there are many rural district councils in a quandary as to recovery of damage to roads caused by timber haulage, a condition of things which the complex laws upon extraordinary traffic do not materially assist. I have shown the letter to the Chairman of my Highways Committee, who welcomes what has been suggested, and if some steps could be taken upon the lines advanced by Mr. Haworth we should be glad to assist. It has occurred to me whether the County and Rural District Councils Associations could lend their aid in obtaining a much-needed settlement of the present impasse? It is to be hoped that surveyors of all highway authorities who are suffering from these conditions will take immediate steps for supporting Mr. Haworth in his very opportune proposals.—Yours faithfully,

R.D.C. Engineer and Surveyor.

June 11th, 1917.

Bungalows and Disease.—On Wednesday, at a meeting of Whitley and Monkseaton Urban District Council, Dr. Sparks, medical officer of health, reporting in regard to a case of measles, said the patient was living in a bungalow. Three persons were living in the single-roomed dwelling, and any isolation of the patient was impossible. The ground around the bungalow was saturated with slop water, and house refuse was littered on the ground in the immediate vicinity. He must again point out the great risk of the spread of infectious disease which they ran so long as these erections were tolerated in the district.

Municipal Engineering in America.*

By A. F. MACALLUM, Commissioner of Works, Ottawa.

Probably there is no branch of engineering that calls for such diversified knowledge as that demanded from the municipal engineer. Certainly he is supposed to have a knowledge of the cost of installing and operating public utilities and executive ability to see that this is at a minimum and comparable with privately owned enterprises. When a city reaches any considerable size it is not possible to follow the details of design and construction of the different works to be carried on, and the practical engineering work must then be carried out by special engineers devoting all their time to particular branches while the chief devotes his time to the executive or business work of the department and the policy to be developed as the growth of the city brings forward new problems. It is claimed of municipal engineers that they follow but do not lead in such matters and seldom initiate new policies, but wait until councils and public opinion force them to meet the question. This will be found to be true where the municipal engineer does not keep up his reading and confines himself too much to details.

WATER SUPPLY AND DISTRIBUTION.

Of the different branches of municipal engineering undoubtedly the most necessary is the supply and distribution of water. The city which can get its supply without, in some manner, treating it, is in a fortunate position. The two standard methods of treating used in America, one by means of graded sand and usually without the use of chemicals, the other by mechanical methods for the treatment by chemicals, give equally effective results, although the selection of which shall be adopted is governed by local conditions.

In New York a very interesting discussion has recently taken place regarding the advisability of filtration outside of chlorination; but because of the diametrically opposite opinions advanced by the engineers of various municipal bodies interested, filtration outside of hypochlorite treatment was decided against, although it was shown that such treatment did not remove bacteria embedded in particles of suspended matter, decrease turbidity, lessen colour or vegetable stain or remove swamp odours or tastes.

The pumping plant in any waterworks system is always of paramount importance. The power used, steam, water, gas, or electric, will depend principally upon the operating cost of these motive agencies delivered on the shaft, along with the capital cost of installation, including the size of relative buildings.

With reference to the quantity of water used, the usual basis of calculation in America for a new system is 100 gallons per head. Toronto uses 95 and Hamilton 110, while Ottawa, strangely enough, uses over 210 gallons per head, most of which, of course, is waste. Cleveland, on account of waste of water, could not build pumps fast enough until meters were installed, and the consumption dropped 50 per cent. To universally meter the city of Ottawa would cost about £60,000, but the time will come when it will be done in preference to paying excessive power rates for pumping water. We will then have the usual cry that water should be free as air, that people should not be restricted in its use, and all the other time-honoured arguments against this waste, which seems to be the heritage of people on this continent.

SEWAGE TREATMENT RELATED TO WATER SUPPLY.

When a town has secured a water supply the necessity for sewers becomes apparent, with (in some provinces) the treatment of this sewage to a more or less vague standard which a committee of the Canadian Society of Civil Engineers is now trying to bring to some kind of uniformity throughout the different provinces, but so far with but indifferent success.

Most of the older cities have combined systems, but most of the new places have separate systems. Both have still their advocates, but, with the development of sewage treatments, the separate system has the advantage, especially where the sewage has to be pumped.

The treatment of sewage, becoming necessary as the country builds up, is yet in a state of evolution. The degree of treatment will vary with local conditions; for instance, at Baltimore it is given a secondary treatment on account of the oyster beds near that city.

The object of present-day methods of sewage disposal has been to take advantage of the oxidation process through the intermediary of living organisms. Those that have failed are those that have not supplied these organisms with a sufficient supply of oxygen to carry out their functions. In connection with sewage treatment there are two distinct factors: (*a*) the removal of all causes which may effect a nuisance, and (*b*) the removal of all causes which may effect disease.

Most of the standard methods of sewage disposal using screens and sedimentation tanks perform only the functions of clarification to a greater or less extent. By filtering afterwards through slag or stone the nuisance is altogether removed, and if necessary to remove the disease germs the effluent can then be chlorinated.

This, then, seems to be the present-day idea, namely, to remove from the sewage only the chemically organic attributes which create a nuisance by decomposition. No longer do we find the septic tank being built, for, being wrong in principle, it is doomed as an integral essential to any method of sewage disposal.

CITY STREETS.

A visitor to a city may forget its beautiful buildings, but he will never forget its streets, especially when they are bad. Of the materials in use for pavements may be mentioned granite and sandstone blocks, wood blocks, asphalt blocks, brick, sheet asphalt, asphalt concrete, and concrete. Of these materials the stone and wood blocks are used for the heaviest traffic, asphalt brick and asphalt concrete on medium, and concrete on light. In this country, except in limited areas on heavy grades combined with heavy traffic, granite blocks are not necessary, and are seldom used on account of the high cost of construction and excessive noise unless well laid. Treated wood block in increasing amount is being laid as meeting most of the requirements, besides being quiet on heavy traffic streets.

On street car streets most municipal engineers favour the lip girder rail, and all street railway engineers favour the tee rail, one side because the possibility of grooves cut alongside the rail is limited, and the other because of the longer life of the rails. The pavement to be laid between and alongside the rails is limited to stone block, wood block, and brick. A few places have laid the asphalt right up to the rail, notably New York, where very heavy rail sections are used, but usually it is not a success. The tracks should, of course, be rigid, for no pavement will stand up alongside a track that moves under car operation. The spaces alongside the web of the rail should also be carefully filled to prevent as much as possible the access of water to the base of the blocks.

On pavements there is comparatively little to say, although there is more friction with citizens in outlying districts over these than all other improvements combined, especially where the surface is of a rolling nature. The average citizen seems to believe that the grade of the pavement should be the same as the front of the land he occupies, and that if there be a cut or fill opposite then someone has blundered in the city engineer's department.

HOUSE NUMBERING AND STREET SIGNS.

House numbering, street signs, and street lights are important municipal subjects. The numbering of houses is a municipal function which too often does not receive the attention it merits from officials, judging from the inconvenience suffered by both citizens, strangers, and the postal system. A city laid out irregularly will require a somewhat different treatment from one on the rectangular plan. Probably the most common and simplest way is to begin numbering the houses on any given street at one end of that street and continuing the numbers in succession towards the other end, allowing a number to each unit of a uniform number of feet, such as 25, the odd numbers on, say, the north and west sides. The numbers should be of such a nature that a person can readily see them.

Street signs should be at each street intersection

* Abstract of paper read before the Ottawa Branch of the Canadian Society of Civil Engineers.

and on each corner of the intersection it they are to afford the greatest convenience. They should be plainly visible from street cars, and pavements, both by day and night. In Hamilton the signs are so placed on electric light posts that the light shines on them. These signs are strongly made of iron, enamelled with blue background and white block letters.

In the lighting of streets it is desired to get as nearly as possible uniform illumination over the entire area of the street. The aim generally is to insure that the illumination at no point will be less than a given minimum and by means of refractors as nearly uniform as possible.

REFUSE COLLECTION AND DISPOSAL.

The collection and disposal of city waste is a question that must be decided at some time as a town grows, and each city must work out its system for collection and method of disposal. By refuse I include rubbish, garbage, and ashes, which vary in each city, and also in different districts of a city, the poorest districts having the least amount of garbage and ashes.

The disposal of the city refuse is generally by dumping and filling in low places around a city, with more or less nuisance if close to residences. Cities of over 150,000 can operate reduction plants and pay operating costs. In some of the cities both reduction and incinerator plants are in operation.

Incinerators are better for smaller cities, but it should be remembered that these plants, while they will operate satisfactorily under definite physical conditions, if these conditions be altered they will not operate satisfactorily. For this reason, of 280 incinerators built from 1885 to 1908, 102 have been abandoned or dismantled. However, for the smaller cities they are about the only plants to be installed when the dumping places have been filled.

The above outlines but the work in the more important departments to be covered in municipal engineering and does not touch the smaller and often more troublesome matters that crop up and are always sent on to the man who is supposed to know it all—the municipal engineer.

LAW NOTES.

Edited by J. B. Reignier Conder,
Solicitor of the Supreme Court.

Land Adjoining Highway—Removal of Fence: Claim for Damages—Alleged Trespass by Highway Authority.—The recent case of *Critchlow* v. *Uttoxeter Urban District Council* (Uttoxeter County Court, May 11th) is of considerable interest to highway authorities. The plaintiff (who is a member of the council) claimed 10s. damages for alleged trespass by the council in breaking down part of a fence at his nursery. The real point in dispute was whether there was a public right of way across a piece of land between the Pickmalls Brook and the approach road to the county bridge over the brook. The land was acquired by the plaintiff's father in the year 1869, when a weighing machine for the use of carters coming to the nursery was put up on it. In 1885, when the plaintiff's father died, the machine was removed, and the land was then enclosed on all sides with sheets of corrugated iron. In the year 1900 the plaintiff's mother, who had succeeded to the property, entered into an agreement with the council to pay 1s. a year by way of acknowledgment of the public right over the land, and this payment was made up to 1909. Early in the present year the council requested the plaintiff to pull down the fence separating the land from the road. This he refused to do, whereupon the council instructed their surveyor, Mr. P. C. Woodhall, to remove it, which he accordingly did. On behalf of the council several old inhabitants were called as witnesses, from whose evidence it appeared that for many years the public had used the land for the purpose of getting to the brook bath, to fetch water and to water horses and cattle, and also in order to cross the brook by means of the stepping-stones which were there before the bridge was built. Evidence was also given by Mr. P. C. Woodhall, the surveyor to the council (who produced a tithe map showing a public right of way over the land), by Mr. H. C. Luscombe, the relieving officer, formerly clerk to the late Mr. F. S. Hawthorn), and by Mr. Frank F. Hawthorn, the clerk to the council. The judge after viewing the land, held that there was a public right of way across it to the road. He made a declaration to that effect, and gave judgment for the council with costs. In the course of his judgment he said the land had been open for many years, and there was no evidence of its having been enclosed until the year 1885. He thought there was a right of way over the land across the brook to the other side. If there was a public right of way it could not be lost by non-usage. The tithe map, made in 1832, seemed to him to be strong evidence. He thought the council were justified in their action.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

Compensation to Officials on Alteration of Area.—"C. V." writes:—I should be pleased if you could give me any information concerning the incorporation of a small place by a larger one, particularly so far as it affects the compensation of officials? I understand that when a place is incorporated the place or town making the application for amalgamation must compensate the officials who are serving the place which is to be included in the larger. Can you inform me upon what the terms are based, particularly in reference to a newly-appointed official whose appointment has been made on a permanent basis, and who is about forty-five years of age?

Every officer who suffers direct pecuniary loss by abolition of office, or diminution or loss of fees or salary, in consequence of an alteration of area, is entitled to compensation, to be paid by the authority to whom the powers of the authority whose officer he was have been transferred. In fixing the amount of compensation regard must be had to the following considerations viz.: (1) The direct pecuniary loss which the officer suffers; (2) the conditions of his appointment, as *e.g.*, whether it is for life, or for a fixed term, or at pleasure; (3) the nature of his office; (4) the duration of his services; (5) any additional emoluments which he requires in consequence of the alteration; (6) any emoluments which he might have required if he had not refused to accept a new office; (7) all the other circumstances of the case. The amount must not exceed that which, under the Acts and Rules relating to the Civil Service, is payable to a person on abolition of office—viz., in the case of appointments made after 1909, on a basis of one-eightieth of the annual salary and emoluments for every year of service, but not exceeding two-thirds of the annual salary and emoluments.

Contract with Urban District Council.—"Vortex" writes: An urban district council have entered into a contract with a builder to erect a number of workmen's dwellings. I shall feel much obliged if you will kindly favour me with your opinion, through the medium of The Surveyor, as to whether a member of the council, who is a party to the contract, can legally, under sec. 46 of the Local Government Act, 1894, supply the contractor with building materials for the erection of such dwellings?

In my opinion the member cannot legally supply the contractor with materials to be used in the erection of these dwellings. By so doing he would, I think, be "concerned in" the contract with the council, within the meaning of the section, sub-section (1) (*c*), and would thereby become disqualified.

INSTITUTE OF CLEANSING SUPERINTENDENTS.

The annual conference of Cleansing Superintendents will be held at Nottingham on July 10th.

Programme.

11 a.m.—Official reception at the Exchange by his Worship, the Mayor (Mr. J. E. Pendleton). Presidential address.
Paper, "Electric Vehicles," by Mr. J. A. Priestley, cleansing superintendent of Sheffield.

1 p.m.—Lunch, kindly provided by the chairman of the Nottingham Health Committee (Councillor H. Spray).

2.20 p.m.—Annual general meeting of members at the Exchange.

Mr. Terry would be glad to arrange for any of the delegates to inspect his depots if they will notify him beforehand.

Dublin Housing Schemes.—The amended plan of one of the series of Dublin housing schemes, that in the Spitalfields area, provides for one hundred five-roomed, 215 four-roomed, and 253 three-roomed houses, giving accommodation for 2,800 persons. Provision is also made for the erection of baths and washhouses, public library and reading-room, and the provision of two playgrounds. The estimated cost for the first section is £56,500, for the second £62,500, and for the third £49,500, and road construction £23,010

House Refuse: Its Calorific Value and Its Possibilities.*

By REGINALD BROWN, M.INST.C.E., M.I.MECH.E., F.S.I., F.R.SAN.I., &c.

These are days when "utilisation" must come before "waste," not only for the mere sake of utilisation, but also because the times demand that economy—true economy—must be exercised. The craze of utilisation must not, however, override true economy—the two are not always synonymous terms. House refuse has been, and is, looked upon as a material to be got rid of as quickly as possible for the protection of the public health, and in towns, large and small, the problems of its collection and disposal are very real.

METHODS OF DISPOSAL.

It is not the intention of the author here to discuss in any way the collection of refuse; he has quite sufficient to do, in the short time at his disposal, to deal with its disposal. The methods of disposal may be classed under the headings of tips, brickfields, barging, railing, destruction by fire, and conversion into a form to be used as a manure. Every municipal engineer has his own idea as to the best method. In those districts where there is plenty of land remote from houses the old-fashioned tip will no doubt remain in use for many years, because, although it has very objectionable features, it is probably the cheapest form of so-called disposal. Again, districts having brickfields in close proximity thereto may, and do, get rid of the refuse by delivering it at these brickfields, to be eventually used by the brickmakers in "burning" bricks. The fact that refuse has calorific value is evidenced by its use by brickmakers. Districts in and around such places as the Metropolis have extreme difficulty in getting rid of the refuse, and are perforce compelled to arrange for its conveyance into the country either by barge or rail, or both, at sometimes a very high cost, to be used for filling in low places, use in brickfields, on land, &c., or to adopt the more costly method of disposal by destruction by fire within their own boundaries. In passing the author would strongly urge that local authorities ought never to be permitted to send their refuse into the surrounding country to pollute the air of other districts, but should be compelled to deal with same in a sanitary manner within their own area, or, at the most, in close proximity thereto. This—in the majority of cases—only leaves one method of disposal—viz., destruction by fire.

The author must, however, state that great credit is due to Mr. Harrison, the borough engineer of Southwark, who has attempted to solve the problem of satisfactory disposal by crushing the refuse into a powder and sending it into the country for manurial purposes. From Mr. Harrison's experience of the demand for such an article there is much to prove that refuse has manurial properties—of course some more than others—and the principle of "what comes from the land should be returned to the land" is well illustrated by his methods.

Without at all wishing to belittle the use of crushed refuse as manure, and bearing in mind that the refuse from every district is not of the same character, the author is of opinion that in the majority of towns a very much greater percentage is "combustible" (and, consequently, of calorific value) than "fertilising." Be this as it may, it is the object of the author to deal with the "calorific" side in the first instance, and afterwards combine it with the "fertilising" side, so that the principle of returning to the land that which came from thence shall be adhered to in a very much wider sense than is at present known and practised. There is no reason in the world why both the heating value of the refuse should not be utilised as well as its fertilising value; in fact, a judicious combination of the two is, the author suggests, "true economy"—as he attempts to show in this paper. The first question that one desires to ask is: If it is possible to conserve both the heating and fertilising value of house refuse, and by so doing to increase in other ways the supply of fertilisers, is the suggestion worth investigating? The author is confident in leaving the answer to the members of this Institution.

First, then, as to the "heating" or "calorific" value—the author does not wish to split straws about the matter—is it worth while to conserve and utilise the heating value, and, if so, how best shall it be carried out?

CALORIFIC VALUES.

At the beginning the author will no doubt have the objection raised that house refuse is such an uncertain material that its calorific value cannot be depended upon. Agreed if you like; but if it has any calorific value, should this value be wasted? The author thinks not. He is, however, not so stupid as to think that refuse consisting of all cabbage-leaves, for instance, should be utilised as fuel; it would be far better to use it as a manure, but even then he rather fancies it would be best to reduce it to "ash" first, and apply this latter to the soil—as it contains material required for plant food—rather than to apply crushed cabbage-leaves direct to the land; in the one case you get the material in a form which is fairly easily assimilated by plants, whilst in the other case it requires time for the material to be broken down before the plants can use same, besides which the cost of carriage over distances is reduced to a minimum. For the purpose of settling what is the calorific value of house refuse, it is as well to consider the matter first from the theoretical point of view; indeed, if a fair comparison is to be made with other fuels, this is the only method open to us. It will no doubt be agreed that when fair comparisons are to be made between different things, the conditions of working in all cases should be exactly similar. Now the standard fuel with which house refuse can be compared is coal, but the two materials are of quite a different character. Coal is a solid fuel, and consists of a few fairly uniform constituents, principally carbon, whilst house refuse is a heterogeneous collection of all kinds of combustible and incombustible material, and a good deal of moisture, and never alike on two occasions.

HOUSE REFUSE AND COAL VALUES.

The calorific value of coal can be ascertained by calorimetric tests, but it would be useless to apply the same test to house refuse, as received at a disposal works. The heating value of coal can, however, also be ascertained by analytical methods, and the same methods can be applied to house refuse, but it would be a tedious process to undertake the analysis of house refuse under all its conditions. A comparatively few analyses of a particular coal will settle its average theoretical calorific value, but many analyses would be required to settle the average theoretical calorific value of house refuse. Remembering this, one sees how impossible it is to dogmatise on the latter; no engineer would dare to do so. Analytical methods, however, may be used, for what they are worth, to give some idea of the number of "heat units" in refuse. It would seem to be better if various kinds of house refuse could be burnt in the same furnace under exactly similar conditions as coal; but here again the difficulties of arriving at any satisfactory results are formidable; indeed, the two classes of fuel could not very well be burnt in the same furnace. What, then, is the basis which one may take? For the purposes of this paper the figures given in the "Empire Year-Book" (published by "Municipal Engineering and The Sanitary Record") are quite good enough for the purposes of discussion. In that publication the author finds the following:

COMPOSITION OF REFUSE.

Constituents.	Per cent Composition.
Breeze and cinders	50
Paper, straw, fibrous and vegetable matter ...	16
Coal	7
Bones and offal	6
Rags	4
Coke	3
Ash	12·0
Dust, dirt, &c.	2·0
	100·0

As no mention is made of the moisture present it is assumed that the above figures are calculated on

* Paper read on the 6th inst. at a meeting of the Institution of Municipal Engineers held in London.

"dry" material, hence the author has re-calculated the table, with the following results:

Composition of Refuse.

Constituents.	Per cent Composition.
Breeze and cinders	36
Paper, straw, fibrous and vegetable matter ...	12
Coal	·7
Bones and offal	·6
Rags	·4
Coke	·3
Total combustible	50·0
Incombustible	25·0
Moisture	25·0
	100·0

On these figures only 50 per cent of the refuse is available for burning, and, a careful calculation shows that one might expect to find a total heat capacity of 2,818 British thermal units per lb. of refuse, which in themselves would under the best conditions of burning, evaporate 2·46 lb. of water (from and at 212 deg.). Some of these units must, however, be utilised to evaporate the moisture in the refuse before useful external work can be secured. If, however, the moisture could be eliminated, then the calorific value of the dry fuel would immediately jump to 3,756 B.T.U.'s per lb., and if steam coal is taken as 14,500 B.T.U.'s per lb., then such house refuse would, by removal of moisture only, and without reinforcement of any kind, be about one-fourth that of coal.

Destruction by Incineration

These figures are interesting, because they show that average quality house refuse in its ordinary "destructor" conditions is theoretically equal to just under one-fifth that of steam coal, whilst if the moisture is eliminated, and without reinforcement, its value increased to one-fourth that of steam coal.

(To be concluded.)

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

APPLICATIONS FOR LOANS.

Derby T.C.—£4,000 for electric motors and £2,000 for mains.

Folkestone T.C.—£1,000 for shelters in the Leas Cliff, and £1,400 for new cells at the refuse destructor.

Oxenhope U.D.C.—£7,000 for a water supply scheme.

Wakefield T.C.—£11,947 for the Alverthorpe housing scheme.

Withernsea U.D.C.—£1,000 for the new sea wall.

Worthing T.C.—£2,000 for the reconstruction of footways after the war.

Coventry Waterworks Finances.—Coventry water profits in the year ended March 31, amounted to £6,625, and £5,000 goes to the rates.

Improved Housing for Scotland.—Sir Rowland Anderson, president of the Institute of Scottish Architects, in his address at the first annual meeting held last week at Edinburgh, said that at the foundation of the question of housing was that of getting cheaper [illegible] land. Before that difficult question was solved very little could be done, and progress in this [illegible] would be slow. Hitherto they had been compelled to pile families on the top of one another, as many as sixteen being accommodated in layers, and all entering off a common stair. He believed attempts were being made to alter this for the better. With cheaper land the building of self-contained houses could also be improved, and sunk floors, sometimes double, could be abolished, and with them the [illegible] and high stairs.

FOR OTHER ADVERTISEMENTS

See End of Paper.

SECOND HAND SEWAGE DISTRIBUTOR wanted. Particulars to Box 1,600, Offices of The Surveyor, 24 Bream's-buildings, Fleet-street, E.C. 4. (3,437)

THE ILMINSTER GAS COMPANY has for Disposal 1,700 ft. new Fire Hose, only been used once on grass ground; also 700 ft. secondhand Hose, in good condition; Screened Couplings. May be inspected at any time, and they are prepared to accept offers for the whole or part.—Addressed to the Manager, Gas Works, Ilminster. (3,438)

STAINES RURAL DISTRICT COUNCIL.
DISTRICT No. 2.

Appointment of a Sanitary Inspector, Inspector of Cowsheds and Dairies, Inspector under the Housing and Town Planning Act, Inspector under the Local Authorities "Food Control Order, 1917."

Applications are invited for the temporary services of a gentlemen to carry out the above duties for the duration of the war.

The candidate appointed must devote the whole of his time to the duties of his offices, and will be required from time to time to render assistance to the registration officer in connection with the maintenance of a national register.

He must hold the certificate of the Royal Sanitary Institute and be ineligible for service in His Majesty's Forces; he should also have a good knowledge of the district, and be able AT ONCE to take up his duties.

Salary at the rate of £12 per month, with the addition of £1 5s. per month to cover the cost of provision and maintenance of a bicycle and office accommodation.

Applications in the candidate's own handwriting, together with copies of three recent testimonials, to be sent to the undersigned, not later than the 20th inst.

GEO. W. MANNING,
Acting Clerk.

Council Offices, Ashford, Middlesex.
14th June, 1917. (3,435)

THE MALDENS AND COOMBE URBAN DISTRICT COUNCIL.

Wanted at once, Mechanical Engineer (temporary), with thorough knowledge of Diesel oil engines, gas engines, and pumping machinery.

Preference given to man with some experience in sewage treatment. Must be ineligible for military service.—Apply, stating salary, age, and full experience, to the Surveyor, Council Offices, New Malden, Surrey.
13th June, 1917. (3,436)

CHEPSTOW URBAN DISTRICT COUNCIL.
APPOINTMENT OF SURVEYOR AND INSPECTOR OF NUISANCES.

The above Council require the services of a competent Surveyor and Inspector of Nuisances, at a salary of £200 per annum, rising in three years to £250.

Applicants must be ineligible for military service.

Candidates must be experienced in surveying, preparation of plans and estimates, road-making, drainage, sewage treatment and sanitary matters, and be able to satisfy the requirements of the Local Government Board as an Inspector of Nuisances (the appointment of Inspector being subject to the approval of such Board).

The Inspector's duties will include those under the Public Health Acts, the Orders of the Local Government Board, the By-laws of the Council, the Dairies, Cowsheds and Milkshops Orders, Factory and Workshops Act, 1891, the Housing and Town Planning Act, the duties of Inspector of Petroleum, and Inspector of Port Sanitary Authorities, &c.

The successful candidate will be required to devote his whole time to the service of the Council, to give satisfactory security in the sum of £300, and to reside within the district.

Canvassing, either directly or indirectly, will disqualify.

Selected candidates will have notice to attend on the day of election, and will be allowed third class railway fare.

Applications, endorsed "Surveyor and Inspector," stating age, experience and qualifications, with copies of not more than three recent testimonials, must be sent to me, the undersigned, not later than the 7th July, 1917.

F. EVANS,
Clerk to the Council.

Council Offices,
Bank Buildings,
Chepstow.
12th June, 1917. (3,439)

Municipal Work In Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Bradford T.C.—The Health Committee recommend the erection of a central laundry at Valley-road.

Bridlington T.C.—The architect has received instructions to prepare plans for additional office accommodation.

Gateshead T.C.—The town council have received an offer of £15,000 from the Carnegie Trustees for a public library.

Ramsgate T.C.—The General Purposes Committee will discuss a proposal to convert the pavilion into a swimming bath.

HOUSING AND TOWN PLANNING.

Bedwellty U.D.C.—The council have adopted the recommendation of a special committee proposing that negotiations be opened for sites for the erection of 1,000 houses after the war.

Pontypool U.D.C.—In reference to a proposed scheme for the erection of 200 working-class houses, the clerk has been instructed to obtain particulars and the cost of a site or sites.

MOTOR TRANSPORT.

Batley T.C.—A committee has been requested to report on a proposal to purchase a motor wagon.

Edinburgh C.C.—A sub-committee of the Gala District Committee has been asked to report upon a proposition by the district surveyor to purchase another steam tractor and wagons.

Fareham U.D.C.—The Fire Brigade Committee have been asked to consider the purchase of a motor tractor or motor fire engine.

Hindley U.D.C.—It has been agreed to purchase a motor ambulance.

Hawick T.C.—The town council are considering the purchase of a motor fire engine.

Islington B.C.—A committee recommend the acceptance of the tender of the Lacre Motor Car Company, 78 York-road, King's Cross, London, N., for the supply of a motor sweeping machine.

REFUSE COLLECTION AND DISPOSAL.

Bournemouth T.C.—The borough engineer, Mr. F. P. Dolamore, reported that waste paper and tins were being separated at the destructor, and that since the last council meeting £75 had been received for consignments of paper.

Leeds T.C.—The city council have purchased, for the purpose of a refuse tip and a road improvement, a plot of land between Harehills-lane, Nowell-lane, Hudson-road, and Clifton-grove. The cost was £3,700.

Haworth U.D.C.—It was reported that steps had been taken by the Sanitary Committee, preparatory to the beginning of an extensive scheme of waste collection. The public were being asked to keep separate from the ordinary household refuse waste paper, old metal, old woollens, glass jars and bottles. The public were also invited to assist the committee by notifying the sanitary inspector when they had accumulations of such articles, large or small, and they would be collected. The material would be sorted by the Sanitary Committee and sold to the benefit of the public generally.

Swansea T.C.—The borough surveyor, Mr. J. R. Heath, has been authorised by the Health Committee to arrange for the collection of old rags, bottles, tins, and similar refuse. It was stated that after the war the scavenging department would permanently collect these things, as it would not only mean revenue, but fewer cartloads of refuse to be tipped.

ROADS AND MATERIALS.

Axbridge R.D.C.—The surveyors, Mr. J. Lovell and Mr. J. K. Dunster, have received instructions to prepare a schedule showing the district roads chiefly affected in connection with Admiralty and War Office work.

Dublin T.C.—It has been agreed to purchase property in Chancery-street for £11,000 for a widening scheme.

East Preston R.D.C.—It was reported that the county surveyor (Mr. H. W. Bowen) had accepted the offer of the services of Mr. C. W. Leeney (the rural district council's surveyor) to assist in supervising road work on the southern roads, and the council agreed that the salary of 30s. per week should be paid direct to Mr. Leeney. It was also decided, on the request of the clerk to the Southwick Urban District Council, to allow Mr. Leeney to act as sanitary inspector for the urban district for three months as an experiment. Mr. Leeney is also acting as surveyor and inspector for the Steyning East Rural District, and the opinion was expressed that he had his hands very full. Mr. Leeney assured the council that his own work in the East Preston district would not be neglected. He also reported that his exemption from military service would expire early next month, and it was decided that the council should lodge a claim with the local Tribunal for a renewal. Mr. Leeney reported that he had attended a conference of surveyors held at Horsham at the county surveyor's request. The object was to arrange for particulars to be supplied by each district to the Road Stone Control Committee of the Ministry of Munitions. They were informed that complaints had been made to the Government of the difficulty of obtaining material for the repair of highways of national importance, in consequence of which it was proposed to schedule these roads throughout the country with a view to an allowance of road material being made by a Board of Assessors to the roads requiring it. He had given particulars of certain roads in the East Preston district.

Norfolk C.C.—The county surveyor, Mr. W. W. Gladwell, informed the Eastern Highways Committee that he had received a communication from the Road Board stating that the War Office had now decided that orders for steam rollers for the British Government should be given direct by the local authorities, and the necessary accounts forwarded to the Road Board for payment. He had written to the firms of Messrs. Burrell, of Thetford, and Messrs. Aveling & Porter, who had informed him that the prices had been increased a further 15 per cent, or a total increase of 30 per cent since the tenders were first submitted. That meant a sum of £1,293 over the first quotation. The committee agreed to accept the prices on the understanding that no responsibility was accepted for the increased prices from the time the county surveyor had given the order.

Redruth R.D.C.—A suggestion was made that the Clinton-road entrance to the town should be tar-sprayed in order to check the dust nuisance, and Councillor Trestrail said there would always be a dust nuisance until proper binding was used for the roads. A different system of road rolling and metalling must be introduced to get rid of the annoyance. The council eventually referred the matter to the Highways Committee for consideration.

Scarborough R.D.C.—The surveyor, Mr. A. J. Iveson, has prepared an estimate for the repair of the Great Moor-road, Hutton Buscel, amounting to £350, which it is proposed to charge to those engaged in timber hauling.—The council are considering the construction of a new road between Cayton and Folkton.

Tyrone C.C.—The council have passed provisional declarations for direct road labour schemes for Clogher and Dungannon.

Westmorland C.C.—It was reported that the total road expenditure last year was £3,000 less than the estimate. For next year the estimate was £15,466, but this would not all be spent if the war continued.

SEWERAGE AND SEWAGE DISPOSAL.

Alcester R.D.C.—The sanitary surveyor, Mr. C. B. Machin, has been instructed to carry out his proposals as to storm-water overflow at Studley, at a cost of £60.

WATER, GAS, AND ELECTRICITY.

Carnarvon T.C.—The borough surveyor, Mr. E. Hall, has received instructions to report on the water supply and the advisability of scraping the pipe line.

Castlereagh R.D.C.—A committee has been appointed to consider the question of the Cregagh water supply. The surveyor, Mr. W. Wheeler, suggested the construction of a storage reservoir, at an estimated cost of £1,000.

Colchester T.C.—It was reported that there was a net profit on the electricity undertaking last year of £341, compared with a loss of £881 in the previous year. The net profit on the tramways last year was £21.

Doncaster T.C.—Owing to increased expenditure in connection with the gas undertaking, it has been decided further to increase the price of gas by three-pence per 1,000 cubic feet.

East Lothian C.C.—The Western District Committee have adopted a scheme for the construction of a 3-in. water main from the Stobshiel main to the east end of Beach-terrace, and also a 2-in. branch pipe from Pencaitland Cross to Tyneholm. The estimated cost of the work is £650.

Gourock T.C.—It has been decided to proceed with the second section of the Daff water scheme, consisting of a pipe from the Roman Bridge, near Inverkip, to the existing system.

Halifax T.C.—The Electricity Committee recommend the erection of a new electricity station at Copley, the existing station, in their opinion, being unsuitable for the growth of the undertaking.

Luton T.C.—The town council are advised by the Electricity Committee to apply to the Local Government Board for a loan of £3,660 for additional mains.

Manchester T.C.—The consumption of water has exceeded 54,000,000 gallons per day, and the Waterworks Committee are becoming anxious about the question of waste. Much of this is in ball taps and water closet cisterns which require repairing, and a deal of this work is held up owing to the scarcity of plumbers.

Middleton T.C.—The Local Government Board have informed the town council, with reference to an application for a loan of £5,100 for the supply of electricity to Neva Mills, that they will be prepared to grant a loan when the restrictions on borrowing have been removed.

Oxenhope U.D.C.—The council have adopted an after-war scheme for a water supply to provide storage for 200,000 gallons—a six days' supply—at Buttergate Sykes, Leeming.

Paul U.D.C.—The engineers report that they have obtained a supply of water for Newlyn West from a well yielding 2,000 gallons per hour, and the council have adopted a scheme proposed by them for the extension of the supply to the whole urban district. It is proposed that the reservoir should be designed for future extension, and be built at first to hold a little more than three days' pumping supply at 30,000 gallons per day. Owing to oats and barley being sown on the proposed site, this will have to be postponed for a time, but the rest of the scheme can be carried out if the necessary land can be purchased. The council unanimously confirmed the scheme for presentation to the Local Government Board.

Rochdale T.C.—A sub-committee of the Waterworks Committee are considering the offer of a water supply at Lumbutts.

Rotherham T.C.—Under the guidance of an expert, the town council are considering the question of obtaining a supply of water for domestic purposes from the Ulley watershed.

St. Thomas R.D.C.—It was reported that, in consequence of the cost of piping the Teplham waterworks having exceeded the estimate by £1,000, the council are asking for sanction to a loan for this amount.

Stockton T.C.—It is proposed to instal a continuous tar distillation plant at the gasworks, at an estimated cost of £4,000.

Sunderland T.C.—The electricity undertaking shows a loss on the year ended March 1st last of £3,037.

Ulverston R.D.C.—A special committee recommend an inspection by an expert, in consultation with the council's engineer, of the probable sources of supply for a new water scheme for Cartmel.

MISCELLANEOUS.

Walsall T.C.—From the balance-sheet of the tramways and motor omnibus undertakings for a period of fifteen months it appears that the balances carried to appropriation account are: Tramways (including £65 brought forward from 1915), £12,028 11s. 2d.; omnibuses, £4,035 15s.; total, £16,064. From the tramways balance the following appropriations have been made: In aid of rates, £2,000; purchase of transport lorry, motor chassis, &c., £2,004; leaving £8,024 net. After deducting certain other payments, the net surplus from the motor omnibuses is £3,146.

PERSONAL.

Mr. A. T. Gouseman, borough engineer and surveyor of Wigan, has had his salary increased by £100 per annum.

Mr. A. V. Ashe, assistant county surveyor of King's County, has accepted a commission in the Royal Engineers.

Sergeant Hollings, son of Mr. G. Hollings, borough surveyor of Wallsend, has been awarded the military medal for gallantry in the field.

Mr. P. J. Foley, Leighlinbridge, Co. Carlow, has been appointed assistant county surveyor for Wicklow. There were 22 candidates for the position.

Mr. J. K. Grant, engineering assistant to the borough engineer and surveyor of Birkenhead, has been appointed technical officer attached to a labour unit, and will shortly be reporting for service.

Mr. G. E. Clarke, borough surveyor and harbour engineer of Boston, who has been acting as an Hon. Lieutenant in the R.N.V.R., has accepted a commission as Second-Lieutenant in that branch of the service, and Mr. Samuel Marjerson has been appointed borough surveyor during his absence, at a salary of £200 a year.

Mr. H. Fox Hill, surveyor to the Ware Urban District Council, has been appointed surveyor of the Frimley Urban District Council. There were 60 applicants for the post. Mr. Fox Hill has been engineer and surveyor to the Ware Urban District Council for over eleven years, and previous to that was in the engineer and surveyors' department of the Ilford Urban District Council, having gone there from the borough surveyor's office at Northampton. He has passed the examination of the Municipal and County Engineers, Royal Sanitary Institute, and is an associate member of the Institution of Waterworks engineers.

Among the names included in Sir Douglas Haig's recent despatches for "devotion to duty" is that of Capt. E. R. Matthews, R.A.M.C. (T.), Officer Commanding 34th Sanitary Section, B.E.F. It will be remembered that Capt. Matthews is Chadwick Professor of Municipal Engineering in the University of London.

OBITUARY.

Mr. Charles G. S. Acock, one of the surveyors of roads to the Devon County Council, died, we regret to state, at Newton Abbot last week, aged 70. He had been in the service of the council for 28 years.

Wolverhampton Municipal Undertakings.—Successful operations are disclosed by the report of the Wolverhampton Sewerage Committee of the corporation at the Barnhurst farm. The year's working to March 31st last shows a balance in favour of the committee of £4,564, compared with £2,589 in the previous year. The Barnhurst farm has an area of about 620 acres, apart from works, roads, and so forth, and the land is cultivated in various ways, 400 acres being under permanent grass and rye grass, 220 acres being utilised for the growing of cereals, roots, and cabbage. Some 130 acres are rented, and of these 20 acres are arable, and 110 acres mowing and grazing land. Upon the farm at the date named were 12 horses, 138 cattle and calves, 720 sheep and lambs, 22 pigs, and 277 poultry. According to the revenue account, the income from live stock was £10,764, and £3,297 for milk. The sum of £1,138 was spent in wages, £8,851 in purchasing live stock, and £2,067 in purchasing maize, dairy meal, linseed cake, &c. For the last twenty-one years the profit amounted to £18,595, of which £16,021 was for 1911 to 1917, the loss being £3,036.

CONSULTING ENGINEERS AND THE WAR.

"ANOTHER YEAR OF DEPRESSION."

The annual general meeting of the Association of Consulting Engineers was held on the 30th ult., at 8 Victoria-street, Westminster.

The hon. secretary (Mr. A. H. Dykes) having read the notice convening the meeting and the report of the last meeting having been taken as read,

The CHAIRMAN (Mr. H. J. Rofe) said, in moving the adoption of the report of the committee for the year 1916-17: We have passed through another year of extreme depression for the consulting engineering profession, and there is little left for us now to do but to "hang on" if possible and keep our staffs together in the expectation of being called in to advise on the works which have been held over in this country during the war and the works of reconstruction which will be necessary in the countries of our Allies on the conclusion of it, which we all sincerely trust will take place at an early date. As British capital will no doubt be largely employed in financing schemes abroad, we trust that British consulting engineers will to a large extent be employed to advise upon them. Your committee has kept in close touch during the year with the Local Government Board, and has continued to urge upon them the necessity for undertaking now the preliminary work on such schemes as are of urgent necessity, and which should be put in hand as soon as possible after the war. A register of work which the local authorities have in view has been compiled from the returns called for in a letter issued by the Board last year, and in the case where works are considered by the board to be of an urgent nature a further communication has been sent out, suggesting that, in order to avoid unnecessary delay when the present restrictions on the execution of works and the raising of loans for the same are withdrawn, particulars of the proposed works should be submitted to the Board as soon as practicable, when they would be considered, inquiries held if necessary, and, if approved, brought to the point when the permission for the raising of the loan only would be necessary to put the work in hand. This places matters in a much more satisfactory condition, and is, I think, as far as the Board can be expected to go. The matter now rests with the local authorities to take the initiative. The Board has already in certain cases granted permission for the raising of loans sufficient to cover the fees and expenses incurred in preparing the necessary plans, specifications, schedules of quantities and estimates, and it is hoped that local authorities will take full advantage of this permission, which, there is no reason to doubt, would be extended to similar applications in respect of works of an urgent nature, and particularly works of water supply and sewage disposal affecting the health of the community. From the point of view of the local authorities, naturally the first question they have to consider is the rate at which they will be able to raise their loans. It appears to me that, although the work may be most urgent and the necessity fully recognised for properly considered schemes being prepared now, so that everything may be ready to commence work as soon as the demobilisation of men from the Army and munition works commences, the local authorities will hesitate to commit themselves to undertake the work unless the Government guarantee their loans for such approved schemes at a fixed rate of interest. I think it highly probable that if the local authorities had their doubts on this important point removed the preliminary work on a number of schemes would be put in hand at once, to the benefit of the country in general and of consulting engineers in particular. Each year greater use is being made of the association by individuals, local authorities, and also Government departments when requiring the services of a consulting engineer specialising in any particular branch of the profession. I venture to think that the committee has done good work in maintaining the high standard of professional conduct among consulting engineers, and as the result of consideration of points arising out of the practice of individual members in co-ordinating the general practice of the members of the association.

Mr. SPENCER HAWES (May and Hawes), in seconding the adoption of the report, said he hoped that the various institutions of which they were members would not overlook the existence of their associates when they had under consideration the appointment of representative delegates to Government and other departments on matters upon which consulting engineers could provide any useful assistance or suggestions.

The report was adopted.

NEW MEMBERS OF COMMITTEE.

The HON. SECRETARY (Mr. A. H. Dykes) then announced that the following gentlemen had been elected members of the committee:

London Members: Mr. J. S. Alford, Mr. H. Howard Humphreys, Mr. James Swinburne, F.R.S., and Mr. G. Midgley Taylor.

Country Members: Mr. W. Cramp and Mr. J. E. Sayers.

Waterproofing.—We are asked to mention that a pit in one of the Tramway sheds belonging to the London County Council, which hitherto allowed water to percolate after heavy rains, has now been made watertight, and the engineer has expressed his appreciation. Pudloed cement was the waterproofing medium adopted for the work.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR AND INSPECTOR.—June 16th.—St. Ives (Cornwall) Town Council. £180 a year.—Mr. E. Boase, town clerk, St. Ives, Cornwall.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 18th.—Ulverston Urban District Council.—Mr. Fred. W. Poole, clerk, Council Offices, Ulverston, Lancs.

ASSISTANT SANITARY INSPECTOR.—June 18th.—Hornsey Town Council. £2 10s. per week.—Medical Officer of Health, Town Hall, Highgate.

SANITARY INSPECTORS.—June 18th.—Stoke-on-Trent Town Council. £90 a year and 5s. per week war bonus.—Medical Officer of Health, St. Peter's-chambers, Glebe-street, Stoke-on-Trent.

ENGINEER AND SURVEYOR.—June 19th.—Rotherham Rural District Council.—Messrs. Oxley and Coward, clerks, 6, Westgate, Rotherham.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 26th.—Ware Urban District Council.—Mr. Geo. H. Gisby, clerk, Council Offices, Ware, Herts.

SEWAGE WORKS SUPERINTENDENT.—June 28th.—Willesden Urban District Council. £120, with house, fuel and light.—Mr. O. Claude Robson, engineer, Municipal Offices, Dyne-road, Kilburn, N.W. 6.

HEALTH VISITORS.—June 30th.—Basford Rural District Council. £100-£105, with an allowance of £5 for uniform.—Mr. Henry Stone, clerk, Public Offices, Basford, Nottingham.

TEMPORARY INSPECTOR OF NUISANCES.—June 30th.—Basford Rural District Council.—Mr. Henry Stone, clerk, Public Offices, Basford, Nottingham.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

WIGAN.—June 19th.—For converting stables into a motor tower wagon garage, for the corporation.—Mr. A. T. Gooseman, borough engineer, King-street West, Wigan.

OAKWORTH.—June 20th.—For pulling down and rebuilding a boundary wall, for the urban district council.—The Surveyor, Council Offices, Oakworth, Yorks.

GREENOCK.—June 25th.—For alterations and additions at Tarf House.—Drawings to the patterson. The Master of Works, Municipal Buildings, Greenock.

SALFORD.—June 25th.—For the supply and erection of steam boiler housing comprised of steel frame-

work and corrugated sheeting, for the corporation.—Borough Electrical Engineer, Frederick-road, Salford.

CHESHUNT.—June 26th.—For the erection of a small-pox hospital, comprising ward block, administration block, and laundry and mortuary block, for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor, Manor House, Cheshunt.

WILTS.—June 30th.—For alteration and repairs at schools, for the county council.—Mr. J. G. Powell, county surveyor, Trowbridge.

GRIMSBY.—June 30th.—For extensions to the isolation hospital, for the rural district council.—The Engineer and Surveyor, Rural Council Offices, Grimsby.

Engineering: Iron and Steel.

KEIGHLEY.—June 18th.—For laying porcelain cable ducts and constructing manholes, for the corporation.—Mr. H. Webber, borough electrical engineer, Electricity Offices, Coney-lane, Keighley.

EGREMONT.—June 18th.—For the supply of a 10-h.p. gas-engine, for the Gas Committee.—Manager, The Gasworks, Egremont, Cumberland.

MANCHESTER.—June 20th.—For the supply of a steam steriliser, for the Board of Guardians.—Mr. J. Macdonald, clerk, Union Offices, All Saints', Manchester.

CHORLEY.—June 20th.—For the supply of one 400-gallon four-wheeled water drag of the latest type, for the corporation.—Mr. J. Mills, town clerk, Chorley.

GALWAY.—June 25th.—For the completion of a dug-out well, for the rural district council.—Mr. E. O'Malley, Mounterowen, Maam.

TOTTENHAM.—June 26th.—For re-setting a Lancashire boiler at the sewage works, for the Tottenham and Wood-green Joint Drainage Committee.—Major W. H. Prescot, R.E., engineer, Town Hall, Tottenham.

Mechanically Propelled Vehicles.

HINDLEY.—June 19th.—For the supply of a Maxwell motor chassis and an ambulance van, for the urban district council.—Mr. D. P. Abbott, surveyor, Urban District Council Offices, Hindley (Lancs).

Roads.

ISLE OF WIGHT.—June 18th.—For team labour and the supply of road materials, for the rural district council.—Mr. H. E. Stratton, clerk, Council Offices, Pyle-street, Newport, I.W.

STEVENAGE.—June 18th.—For the supply of 1,000 tons of 1½-in. to 2-in., 1¼-in. to 1½-in., 1-in. to 1¼-in. broken Guernsey, Leicester, or other granite, and clean chippings and dust, for the urban district council.—Mr. W. O. Times, clerk, Council Offices, Orchard-road, Stevenage, Herts.

WELLINGBOROUGH.—June 19th.—For the supply of Leicestershire granite, best granite, chippings, best granite treated with bi-tarco, best hard limestone, best hard limestone chippings, patent paving slabs, best broken slag, best slag chippings, tarred slag, and stoneware pipes and gullies, for the urban district council.—Mr. J. T. Parker, clerk, 29, Church-street, Wellingborough.

NORTH WALSHAM.—June 22nd.—For the supply of Guelton granite and broken flints for steam rolling, for the urban district council.—Mr. J. W. Stevens, surveyor, North Walsham, Norfolk.

KING'S LYNN.—June 25th.—For the supply of road material, for the corporation.—Mr. Raymond A. Newstead, acting borough surveyor, Town Hall, King's Lynn.

CANNOCK.—June 29th.—For the reconstruction of the main road between Cannock and Hednesford, and other works in connection therewith, for the urban district council.—Mr. R. Blanchard, engineer and surveyor, Council Offices, Cannock.

Sanitary.

KLMESTON.—June 25th.—For the construction of a storm-water sewer about 350 yards 9-in. pipe, together with two flushers, for the urban district council.—The Surveyor, Council Offices, Bedford-road, Kempston, Beds.

ANLWICH.—For the supply of galvanised sanitary pans, 16 in. diameter by 16 in. deep, for the urban district council.—Mr. W. Fanning, clerk, Council Offices, Amlwch, Anglesey.

Stores.

GREENOCK.—June 25th.—For the supply of coal, cement, lime, fireclay pipes, pavement, whinstone setts, road metal, and cartage, for the corporation.—Master of Works, Municipal Buildings, Greenock.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

DUBLIN.—For the erection of seventy-five two-storey houses on the Spitalfields site, for the corporation.—Mr. Charles J. McCarthy, city architect:—

	£
J. & M. Clarke, Upper Clanbrassil-street, Dublin*	22,918
Thomas O'Mahony, Fermoy	22,982
Louis Monks, Kingstown	23,090
Alex. Fraser & Co., Dublin	23,700
Alex. Hull & Co., Dublin	23,995
T. Mackey & Sons, Dublin	24,085
William Doyle, Dublin	24,153
H. & J. Martin, Limited, Dublin	24,182
Farmer Bros., Dublin	25,619
J. & W. Stewart, Dublin	26,997
Municipal Workshop, Stanley-street	27,471
T. McMillen, Dublin	27,600

TEDDINGTON.—Accepted.—For the supply of granite, flints, sewage precipitants, Portland cement and lime, household coal and coke, stoneware pipes, tar-paving and petrol, for the urban district council.—Mr. M. Hainsworth, surveyor, Enfield House, Teddington.

Wills & Packham, Sittingbourne, flints.

Constable, Hart & Co., Limited, 41 Eastcheap, E.C. 3, tar paving.

Eastwood & Co., Limited, Belvedere-road, Lambeth, S.E. 1, Portland cement.

F. W. Berk & Co., Limited, 1 Fenchurch-avenue, E.C. 3, ferric sulphate.

F. Bird & Co., Horton-road, West Drayton, tools.

John Knowles & Co., 38 King's-road, St. Pancras, N.W. 1, pipes, &c.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

21-22.—Incorporated Municipal Electrical Association: Annual Meeting. Institution of Civil Engineers, Great George-street, S.W.

22.—Institution of Water Engineers: Summer Meeting in London.

28-30.—Institution of Municipal and County Engineers: Annual Meeting at Hastings.

29.—Tramways and Light Railways Association: Annual Congress. Institution of Civil Engineers, Great George-street, Westminster. 2.30 p.m.

JULY.

7.—Association of Managers of Sewage Disposal Works: Annual Summer Conference at Worcester.

10.—Institute of Cleansing Superintendents: Annual conference at Nottingham.

APPOINTMENTS OPEN.

ULVERSTON URBAN DISTRICT COUNCIL.

TEMPORARY APPOINTMENT OF SURVEYOR AND INSPECTOR OF NUISANCES.

The above Council invite applications from persons ineligible for military service, experienced in and fully competent to perform the duties of the combined offices of Surveyor and Inspector of Nuisances.

The appointment may be for the duration of the War, and may be determined by one month's notice.

Candidates must be experienced in surveying, preparation of plans and estimates, road making, draining, sewerage work and sanitary matters, and all the duties pertaining to the work of a Surveyor, and be able to keep the prescribed accounts, and should hold the Certificate of the Royal Sanitary Institute or some other competent body recognised by the Local Government Board (the appointment of Inspector being subject to the approval of such Board).

The Inspector's duties will include those under the Public Health Acts, the Orders of the Local Government Board, the By-laws of the Council, the Factory and Workshop Act, the Housing and Town Planning Acts, &c., and generally to obey all the instructions of the Council and their Medical Officer of Health.

Applications, stating age, qualifications, full particulars of experience, present and previous employment, and salary required, together with copies of three recent testimonials, to be sent to the undersigned not later than 18th June, 1917.

FRED. W. POOLE,
Solicitor, Clerk to the Council.

Council Offices,
Ulverston.
June 4, 1917. (3,427)

The Surveyor

And Municipal and County Engineer.

Vol. LI. JUNE 22, 1917. No. 1,327.

Minutes of Proceedings.

Individual Interest in Municipal Enterprise.

Yesterday the annual meeting of the Incorporated Municipal Electrical Association was opened, again in London, war conditions precluding the usual social amenities in the way of receptions, dinners, and visits to places of interest. The president, Mr. F. M. Long, city electrical engineer of Norwich, and inventor of the "rateable value" system of charging for electrical energy, which is widely known as the "Norwich" system, read his address, and Mr. J. H. Bowden, chief electrical engineer to the borough of Poplar, presented a paper on "Individual Interest in Municipal Enterprise." Poplar has long been known to possess one of the most efficiently conducted and soundly organised electricity supply undertakings in the Metropolitan area, and therefore Mr. Bowden's views would in any case command attention; when we add that he advocated a system of participation in the profits in order to enlist the enthusiastic efforts of the whole of the staff in the prosperity and development of the undertaking, it will be obvious that his paper was of immediate interest to the members, particularly those who belonged to the category of "engineer members," as distinguished from committee men. The author's text was the "irrefutable argument"—which he at once proceeded to refute—against municipal trading enterprise, that it does not allow full scope for individual interest, and therefore tends to promote laxity of management and disregard of the interests of the public. Pointing out that the average remuneration of the managing staffs of municipal electrical undertakings was much less than in other walks of life, Mr. Bowden urged that municipalities should place their employees out of the reach of anxiety for the future, and thus enable them to concentrate their attention on the development of the undertakings. In the long run, the interests of the ratepayers, the consumers, and the members of the staff were largely identical—they were all best served by supplying electrical energy at the lowest possible price and with the greatest reliability attainable. With regard to the relief of rates out of profits, the author held that to establish the undertaking on a sound financial basis was the paramount necessity, overriding all other considerations, and showed that Poplar stood in an especially happy position in this respect, thanks to a liberal policy of writing-down obsolete plant and purchasing new machinery out of revenue; but obviously the ratepayer would hardly countenance the allocation of any portion of the profits for the benefit of the staff unless he himself had a share, and Mr. Bowden recognised this by expressing approval of a limited proportion of rate relief on a well-defined scale. Broadly speaking, he allotted 40 per cent of the surplus to the Finance Committee, to be dealt with at their pleasure; 20 per cent of the surplus up to £6,000, and 10 per cent of any further profits, to be divided among the members of the permanent staff, and the remainder of the profits to be devoted to writing-down obsolete plant.

As the profit balance at Poplar has for some years been very considerably in excess of £6,000, even in war years, it will be seen that the inducement thus held out to the staff to become voluntary canvassers on behalf of the undertaking is very appreciable, and we can well understand that excellent progress has been made since the scheme was inaugurated. The surplus in the hands of the Finance Committee, we note, has been largely expended in the establishment of a fleet of motor vehicles for the disposal of destructor clinker, the removal of house refuse, and road sweeping, thus effecting economies and indirectly reducing the rates. Naturally, such a scheme must be hedged about with safeguards, lest it should be said that inflated profits were being shown at the cost of the undertaking; there is therefore a long list of items, including the cost of all new services to consumers, and all improvements to the plant, &c., which must be allowed for out of revenue before a balance is struck, although some at least of these items are usually treated as capital expenditure. A further interesting feature of Mr. Bowden's proposals, though not actually in force at Poplar, we believe, is that thrift should be encouraged among the workmen and other employees by allowing them to invest their savings in the undertaking, and, indeed, compelling them to dispose of a proportion of their bonuses in this way. Without going further into the details of the scheme, we cordially welcome the views put forward by Mr. Bowden; it is, unfortunately, a fact that the higher ranks of municipal employees, not only in electrical departments, are only too poorly remunerated for their labours, which are often arduous and prolonged, although the wages of workmen in municipal employment are notoriously higher than in other occupations demanding no greater ability.

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Local Government in Egypt.

In the course of a paper of great interest which he contributes to the current issue of the *Town Planning Review*, Mr. W. H. McLean, M.INST.C.E., traces the progress of local government in Egypt, and shows how town development and improvement have been fostered under representative institutions. Reporting to the Government in 1913, Lord Kitchener emphasised the advantages of such institutions, both from the point of view of bringing the wishes and needs of

those governed before their governors, and as a means of improving the moral tone of a people by giving them responsibility in managing, as well as providing education in the duties of citizenship. The organisation of Egypt for the purposes of local government may best be understood by comparing it with the system in vogue in this country. In the first place, there are provincial councils, which are analogous to our county councils. Their duties include, *inter alia*, the voting of supplies for local improvements, advising the Government on matters relating to local public works, sanctioning the modification of boundaries, and the provision of elementary education. Next in order of importance come what are known as "mixed municipalities"—that is to say, local commissions on which the foreign element is represented; and the local commissions proper, which correspond with our local authorities, being charged with the care and maintenance of roads, and such matters as lighting, water supply, and scavenging. There remain the villages, which have as yet no local councils, although the necessity for ameliorating their sanitary condition cannot be denied. Indeed, the situation is so serious that Lord Kitchener in the report already referred to speaks of "the deplorable absence of all sanitation in the villages," and the problem of village local government is certainly one that calls for early action. The whole system of local government in Egypt is bound together by the central control exercised by the Ministry of the Interior, which exercises functions comparable with those of our own Local Government Board. In addition, however, owing to the lack of sufficiently experienced technical staff in the municipalities and local commissions, and also in the provincial councils, the Ministry of the Interior undertakes the design and construction of the more important works of town water supply and electric lighting installations, and gives assistance with the preparation of town planning and development schemes for these bodies, while it also undertakes similar work in connection with the design and construction of the more important building schemes. On the whole, it may be said that remarkable progress has been made during the last few years in the inculcation of the principles of local self-government. Difficulties are often experienced at first, particularly in some of the smaller towns. As an example, Mr. McLean states that on one occasion it had to be explained to a new commission that public street lighting is not realised by grouping the lamps near the residences of the members and their friends! In the second part of his paper Mr. McLean proceeds to show the results of the establishment of local government institutions on the problems of town planning and development.

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Town Development.

In regard to town development, the first thing that strikes the reader of Mr. McLean's paper is that existing conditions must not be allowed to extend, and must as far as possible be removed. Many of the towns before being taken in hand are like rabbit warrens with narrow, winding streets, innumerable long, blind alleys and no public open spaces. Moreover, the cemetery is often near the middle of the town, and the streets are evil smelling and littered with garbage. As regards the improvement of such towns, if there are any existing principal streets, it is usual to plan for their widening and straightening, and if possible to improve their connection with the railway station, the mosques, the markets, and any other important public buildings. If a town is badly congested and without any main street, it is necessary to arrange for entirely new streets from north to south and from east to west. Following upon this development, steps are taken for the establishment of street scavenging and watering services, the collection and disposal of refuse, and the provision of a water supply. The last-mentioned is probably the most pressing requirement, as the existing supplies are in many cases far from satisfactory. The construction of the main drainage systems, on the other hand, is not a pressing question in most of the towns, owing to the dry climate and the nature of the subsoil. This is fortunate, for, as drainage works produce no revenue and mean increased taxation, they are not popular with a public which is not educated to appreciate the non-tangible advantages of sanitation. There are, however, a few towns in low-lying situations where it will be imperative to execute drainage works in the near future. Mr. McLean's paper affords good ground for an optimistic view as to the future of local government in Egypt.

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Highway Encroachments.

When a landowner encloses ground over which there is a public right of passage, there are several alternative courses open to the highway authority. They can either indict the landowner for causing a public nuisance, or, with the concurrence of the Attorney-General, they may apply to the High Court for an injunction; or they can adopt the simple plan of having the fence removed. The last of these methods undoubtedly possesses the attractions of simplicity and promptitude—characteristics not usually conspicuous in legal proceedings. It can only be safely adopted, without preliminaries, however, in a very clear case. If there is any reasonable doubt as to the public right of passage it will be prudent, as a preliminary step, to obtain a judicial decision on the point. If the fence is erected within 15 ft. from the centre of the cartway this can be done by summary proceedings under sec. 69 of the Highway Act, 1835, or (where applicable) under sec. 51 of the Highway Act, 1864 (the last-mentioned section, however, applies only to highway boards, rural district councils succeeding highway boards, and county councils possessing the powers of highway boards). In the absence of any such preliminary proceedings, should the authority take the law into their own hands by having the obstruction removed, they may possibly have to fight an action by the landowner for trespass. But that this is a risk which need not deter them, when the public right is clear, is shown by the leading case of *Reynolds* v. *Presteign Urban District Council* (60 J.P., 276). An interesting instance of a successful defence to such an action is afforded by the recent case of *Critchlow* v. *Uttoxeter Urban District Council* (noted in our last issue). In that case the plaintiff had fenced in a piece of land adjoining his tannery, between the Picknalls Brook and the approach road to the county bridge over that brook. The evidence showed that for many years prior to the erection of the fence the public had freely used the land as a means of access to the brook, not only for fetching water and watering cattle, but also in order to cross the brook by means of the stepping stones which were there before the bridge was built. Moreover, on a tithe map made in 1832 the land was shown as being subject to public rights. There was some attempt on the part of the plaintiff to show that boys coming on to the land had been treated as trespassers, and that the only cattle taken across it to be watered were so taken in exercise of a right of way of the lords of the manor. As already indicated, however, the action was a complete failure. Not only was judgment given for the council, with costs, but a declaration was made by the Court, which will, of course, be duly recorded, that there is a public right of way to the

brook through the land in question. We heartily congratulate the council on having so successfully vindicated the rights of the public in this matter.

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The Annual Meeting. The installation of Mr. P. H. Palmer, M.INST.C.E., as President of the Institution of Municipal and County Engineers will take place at the forty-fourth annual general meeting of that body to be held at Hastings on Thursday next, and the two following days. In another column will be found the programme of the meeting, which will be of the usual character, save that the number of papers to be read is exceptionally small—only four being presented. Although this is no doubt partly due to the prevailing circumstances, we venture to think that this is not the only cause. It will be remembered that at some previous annual meetings—particularly last year, at Blackpool—the number of papers read was so great that there was only time for a partial discusssion of some, while others were not discussed at all. This lack of opportunity for discussion of papers which had occupied much time and thought in preparation was certainly rather hard on their authors; and in our opinion this year's gathering will probably be all the better for its more modest programme. At the first day's conference the subject of public abattoirs will be introduced in a paper by Mr. H. A. Brown, of Weston-super-Mare; and Mr. H. T. Wakelam, the county engineer of Middlesex, will deal with "Extraordinary Traffic and Excessive Weights on Highways." On the second day Mr. E. Willis, of Chiswick, will present a paper on "Examinations," and Mr. E. J. Goodacre, of Shrewsbury, will speak on "Dry Rot." It is to be hoped that the first of these two papers will be the means of eliciting the views of examinees as well as those of examiners. The meeting will also include the usual social functions (with the important exception of the annual dinner), and visits to works and places of interest. The institution is once again fortunate in its choice of a president, for Mr. Palmer not only has a long and honourable record in his profession, but also has former presidential experience, having presided over the Institution of Water Engineers in 1905-6. He may be relied upon to further the interests of the institution in every way.

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Local Government In 1915-16. It is the common experience of officials of local authorities that, although the war has resulted in considerable restriction of ordinary municipal activities, the diminution in their work which might consequently have been expected has not in fact taken place. The principal reason for this is that many new functions arising directly out of the war have been thrust upon, and willingly undertaken by, local councils. Mr. Macmorran's annual volume on Local Government* is thus of the ordinary dimensions for the year 1916, and contains all the statutes, orders, forms, cases and decisions of the year in regard to every topic of local government work. The exceptional nature of the time through which we are passing is reflected in the space allocated to the several headings. For example, a large number of regulations and orders are set out, under the title "Defence of the Realm," including those relating to the engagement or employment of workmen, and to the regulation and restriction of building and constructional work. The practical value of this work to municipal engineers can, however, best be gauged by referring to some of the headings which more directly affect their work. These include such subjects as extraordinary traffic, highways and bridges, housing of the working classes, paving and adoption of private streets, refuse removal, sewers and sewage disposal, streets, tramways and water supply. It is evident from the number and importance of the cases decided during the year that local government work in the courts has by no means been at a standstill, although it has considerably diminished; while there has been quite an abnormal flow of regulations and circular letters from the several Government Departments. An encyclopædic volume of this kind is wellnigh indispensable to the official who wishes to have the latest information on every topic available for reference, and we cordially commend Mr. Macmorran's book to our readers for this purpose.

* "Local Government, 1915-16." Edited by A. Macmorran, M.A., K.C., and W. A. Willis, LL.B. Price 25s. nett. London: Butterworth & Co., and Shaw & Sons.

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Control of Road Stone Quarries. An Order issued by the Minister of Munitions states that, notwithstanding his Order of May 9, 1917, taking possession of road-stone quarries in the United Kingdom, Regulation 9 GG shall not be applied to any road stone quarry situated outside England and Wales, or to any road stone quarry, wherever situated, producing only gravel and flint used as road stone; and that the application of Regulation 9 GG shall be postponed until July 15, 1917. It will be remembered that Regulation 9 GG provides that any mine or quarry to which it is applied shall by virtue of the Order pass into the possession of the Minister of Munitions, and the owners shall comply with the directions of the Minister of Munitions as to management and user or be guilty of an offence. The effect of the new regulation would appear to be that no road stone quarry outside England and Wales, and no quarry producing gravel and flint used as road stone, shall be placed under the control of the Ministry of Munitions, although the operation of the original Order as regards other quarries remains unaffected.

TRAVELLING EXPENSES OF CANDIDATES FOR COMMISSIONS.

In the House of Commons Colonel Orde-Powlett asked the Financial Secretary to the War Office if he was aware that surveyors of local authorities who had volunteered at the request of the Road Board for work in connection with military road-making in France had been compelled to pay their own railway fares to London when attending at the request of the Director-General of Military Railways for interview and for medical examination, and again when attending to report at the War Office previously to commissions being granted to them; whether he was aware that in one such case a married man with a child, earning a salary of £175, had to pay over £4 in railway fares; and whether he would issue instructions that such railway fares should be refunded.

Mr. Forster: In accordance with the general rule of the public service, candidates for commission pay their own fares for interviews and on first joining.

Water-Filtration in America.—In 1917 there were 784 water-filtration plants in the United States and Canada, as against only some fifty in 1900. This total includes only the 443 municipally and the 333 privately owned filter plants supplying municipalities and the eight plants owned by the United States Government, thus leaving out of the count the numerous industrial, institutional and other isolated or private plants, which altogether must run into thousands. The rapid progress of filtration is further illustrated by the fact that municipal filtration plants in use in 1900 supplied only 2,000,000 people, compared with the 10,000,000 supplied in 1910 and approximately 20,000,000 who are at the present time enjoying the benefits of filtered water. As still another phase of filtration progress, some twenty years ago an average bacterial removal of 96 per cent was considered fairly good, whereas now results are looked upon as somewhat suspicious unless the bacterial removal is over 99 per cent.

Individual Interest in Municipal Enterprise.*

By J. HORACE BOWDEN, Chief Electrical Engineer to the Borough of Poplar.

The only irrefutable argument against municipal trading as carried on at present is that it does not allow full scope for individual interest, the lack of which tends to induce laxity in management and disregard of the interests of the public.

The scope of municipal enterprise may be regarded as an intervening stage between industrial co-operation and State control. Public opinion is now undoubtedly undergoing a very radical change in regard to the conduct of public business, and, having found it necessary, during war, to institute State control of railways, coal fields, and the production of foodstuffs, it is reasonable to assume that such control will be retained for a considerable period after the war, or may be incorporated into practical politics for the future.

With the retention of State control of national monopolies, it may be anticipated that a considerable impetus will be given to municipal enterprise, particularly in the generation and distribution of electrical energy, and it is with the object of eradicating the only irrefutable argument against municipal trading of to-day that the author has ventured to place his views before the convention.

Viewing the position attained in the business world by the electrical industry at the present day, together with its enormous scope in the future, it must be admitted that the average remuneration bestowed on those responsible for the management of municipal undertakings is considerably less than that derived from positions of equal importance in other branches of industry.

SALARIES AND SECURITY OF TENURE.

There are reasons for this unsatisfactory state of affairs, first, because in the past, when the industry was "in its infancy" and engineers had still their reputations to make, one position was considered a stepping-stone to another of greater importance, and so on until the top of the profession was reached. It was generally understood that an engineer with a reputation to make would give of his best during the brief period usually required before better opportunities presented themselves, and purely nominal salaries became the order of the day, excepting in the cases of the more important municipal authorities. To-day a different order of things prevails, and the transitory periods are few.

Secondly, security of tenure in municipal work is greater than in private enterprise, and in a number of instances provision against retirement is made by the municipality; therefore the incentive to strive after higher remuneration in order to provide for old age is not nearly so great.

Although in Civil Service and Local Government work moderate remuneration and superannuation on compulsory retirement may command a fair recompense for service rendered by the individual, it is not to be expected that the best results would obtain under similar conditions if applied to municipal trading in competition with other industries, as in the case of electricity supply.

In order successfully to control a municipal undertaking, concentration of thought during an undisturbed period of a number of years is necessary on the part of those responsible for the management, and in order to secure this not only should the municipality pay sufficient remuneration to prevent distraction from undivided attention by their official staff, which striving after increased remuneration engenders, but should also offer inducements to the staff whereby the desired results might be attained, to the material benefit of those responsible for their attainment. It is therefore incumbent upon every municipality to give consideration to any scheme which would induce the members of each of its trading staffs to concentrate their whole energy on producing certain results, and, in giving consideration to any such scheme, the varied interests connected with the supply should essentially have equal prominence.

INTERESTS CONCERNED IN ELECTRICITY SUPPLY.

The interests concerned in electricity supply are those of the consumer, the ratepayer, and the staff.

The consumer's interests may be stated as follows: Low prices, continuity of supply, and efficiency of service.

The ratepayer's interests are: Security of guarantee, the creation of such an asset that a cheap supply of power brings to any municipality by the increase of rateable value and participation in profits.

The interests of the staff are: Satisfactory working conditions, adequate remuneration, security of tenure, and participation in profits.

The primary interests of the consumer and the ratepayer are linked indissolubly together. Low charges for supply to the consumer produce the asset to the municipality, but the price paid for the supply should be such as to amply provide for the guarantee given by the municipality on the security of the rates. Cheap prices and participation in profits may appear to be diametrically opposed, but it must always be borne in mind that the ultimate result of low charges means that all ratepayers would become consumers, and therefore any apparent injustice by contributing to rates out of profits would eventually disappear.

The author does not wish it to be understood that he supports the idea that municipal trading should be undertaken purely for the purpose of relieving the rates out of profits resulting therefrom, but he considers that this should be done in a modified form and to a well-defined scale, in preference to the present-day practice of mulcting the profits of electricity undertakings to the detriment of their financial positions.

Consumers' and staff interests are linked, inasmuch as satisfactory working conditions, adequate remuneration and security of tenure tend to ensure continuity of supply and efficiency of service. Low prices to the consumer, and participation in profits by the staff can be made of identical interest by the introduction of proper safeguards to the consumer into any profit-sharing scheme.

The interests of the ratepayers and the staff have everything in common respecting security of guarantee. Judicious capital expenditure is the most effective medium of profit production, and a municipality may anticipate that every possible consideration would be given before capital expenditure is recommended by a staff participating in profits. An asset which has been built up judiciously presents the greatest security for the guarantee of the ratepayers.

The interests of the ratepayers and staff are also common in respect of profit-sharing, and the author is of the opinion that the scheme submitted in this paper will ensure the best results to the ratepayer, and at the same time secure for an undertaking a sound financial footing.

PROFIT-SHARING AT POPLAR.

It is of paramount importance that every municipal electricity undertaking should be placed upon a sound financial basis in priority to any other consideration. Until this is accomplished little can be done towards reduction of prices or participation by the municipality or staff.

For a number of years prior to the introduction of a profit-sharing scheme at Poplar, and before any contribution whatever was made to the rates, a drastic policy of writing down and scrapping obsolete plant was adopted, together with a system of payment out of revenue for all assets for which loans would not be raised for periods of twenty years or over. All existing loans were converted from the annuity or annual instalment to the quarterly instalment system.

To-day the statement of loans outstanding comprises only land, buildings, mains and machinery, with £3,500 for services and £750 for accumulators. Both of the latter will be wiped out during the course of the next three years under the scheme adopted. No money for machinery has been borrowed since January, 1914, all new plant having been purchased out of amounts written down in respect of obsolete plant.

It has been found desirable to establish a fleet of motor vehicles for the disposal of destructor clinker, removal of house refuse, and road-sweeping, and the surpluses from the electricity department are being utilised for this purpose.

The bonus to staff is apportioned as follows, viz.:

A moiety to the principal officers of the staff, and the other to the junior officers and workmen permanently employed *pro rata* to the normal salaries

* Extract from paper presented yesterday at the annual meeting of the Incorporated Municipal Electrical Association.

and wages paid in the year in which the bonus is earned.

The proportion payable to the principal officers is divided as follows, viz.: One-half to the chief engineer and manager, one-fourth to assistant manager, one-fourth in equal proportions to the station and mains engineers and sales manager.

The financial soundness of this scheme must commend itself to all concerned, as, no matter how rapidly an undertaking may develop, the cost of new connections and all improvements to the existing system must be taken from revenue before any sum is available for bonus.

In advocating the adoption of the profit-sharing scheme by the Poplar Borough Council, the author advanced the suggestion that, by granting some recognition to the permanent staff proportionate to the results obtained, not only would every man employed feel a direct interest in economical production, but would also feel concerned in advocating the use of electricity at every possible opportunity. Thus a potential canvassing staff, which, in many other undertakings, is a direct charge upon revenue, would be created.

AN OBJECTION.

On the side of labour the greatest objection to profit-sharing schemes of any description is the tendency to reduce individual labour and rate of wages by holding out prospects of increased bonuses to the staff.

As far as electricity supply is concerned, this objection is not of much account, as an electricity undertaking is not a manufacturing concern wherein output can be calculated at so much per head of workmen. The output of the concern has no direct relationship to the number of workmen employed, and, as only a requisite number of men are employed under any conditions, the payment of a bonus on what is practically the number of units sold does not affect working conditions. As a matter of fact, Poplar has always granted the best conditions of labour (being one of the first undertakings to adopt a forty-eight hour week), also a liberal superannuation and pensions scheme, adequate annual holidays, and ample sick pay allowance to exempt the permanent staff from the scope of the National Insurance Act. The adoption of a forty-eight-hour week has not affected the payment of the minimum trade union rates of wages. The saving aimed at is not in labour, but on materials used, viz., coal, water, oil, &c. The most important point affecting bonus, however, is the promulgation of business, each man being a potential canvasser of the undertaking.

ALLOCATION OF BONUS TO STAFF.

The proportions payable to the principal officers of an undertaking, as set out in the Poplar scheme, may not appeal to every municipality, and, as an alternative, the distribution may be made wholly as a percentage of annual salary or wages. To illustrate the difference between the two systems the author submits the payments made by the Poplar Borough Council as a result of last year's trading, viz., 1915-16:—

Amount available for distribution, £1,262.
Principal officers, £631, or 36·6 per cent of salaries.
Junior officers and workmen, £631, or 6·09 per cent of salaries or wages.

Had the alternative proposition been in force, the whole of the staff would have received 10·43 per cent of their annual salary or wage.

INVESTMENT OF PROFITS ON BEHALF OF THE STAFF.

No profit-sharing scheme would be complete unless careful consideration were given to the encouragement of thrift amongst the staff, and opportunity afforded for reasonably advantageous investment of at least a proportion of the share of profits accruing to the participants.

Compulsory investment of the total share of profit would undoubtedly destroy one of the principal advantages of the scheme. A line of demarcation between voluntary and compulsory investment suggests itself, and the author submits that the benefits of any profit-sharing scheme would be enhanced if the amount accruing at the rate of 20 per cent were to be handed over to the staff to be invested in the undertaking or otherwise at the option of the employee, and that accruing at the rate of 10 per cent be compulsorily invested in the undertaking, all on terms suggested.

EPITOME.

Hitherto individual interest has been centred on outside advancement. The author submits that the time has arrived when opportunities for advancement should be forthcoming in existing undertakings. Although fair remuneration should command a fair return in services rendered, it is assumed that participation in the prosperity of an undertaking would ensure a still better return. Judicious management is the supreme factor in obtaining best possible results, therefore management should participate to the greatest extent in the share of profit to the staff. The scheme presented safeguards the interests of the consumer and the ratepayer, and the fact is kept in view that with universal use these interests become identical, and that universal use can only be obtained by cheap supply.

A prosperous undertaking is an asset to a municipality, as an efficient supply will always attract industry, and thereby increase rateable value. A financial policy of writing out dead capital and abstention from raising loans for short-lived assets is advocated. The scheme put forward will materially assist in giving effect to this policy. Contributions to rates receive recognition in a modified form, but it is suggested that such should be used in payment of public improvements. The importance of promulgation by every member of the staff of the benefits accruing from the use of electricity is not lost sight of. Objections on the part of labour to profit-sharing schemes do not apply to electricity supply. The advantage to the individual and the undertaking of the provision of a sum sufficient for the proper enjoyment of the annual holiday is made a special point.

Probably the most debatable point in the paper is the compulsory investment of bonus in the undertaking, as this infringes somewhat upon the right of free agency, but the author has endeavoured to meet the question, to a large extent, by the recommendation of a middle course, making investment partly voluntary and partly compulsory. Fuller enjoyment of the fruits of labour by the worker is foreshadowed, and profit sharing is put forward as a solution of a problem which will undoubtedly have to be faced by all branches of industry in the near future. A sliding scale, regulating the share in profits by the rise or fall in prices charged to the consumers is put forward, and the author hopes that this matter will be fully commented upon.

A SURVEYOR'S TRAVELLING EXPENSES.

At the meeting recently of the Linton (Cambs) Rural District Council a letter was read from the surveyor, Mr. A. M. Cook, stating that he had considered a proposal which was made at the last meeting, and that he would accept an auto-wheel, with running allowance for petrol and general repairs.

Mr. Cook (the *Cambridge Independent Press* states) attended, and said that his allowance for conveyance was at present £10. He kept horses, but the price of corn was so high that he could not keep it up. He would like £20 for running expenses.

Mr. Beales asked what was the objection to Mr. Cook going on as he had gone. He had got about formerly, not very quickly, it was true, but still he had managed. It did not seem to him to be the time to start new experiments.

The chairman (Rev. Canon Thornton) said that the cost of petrol was 50 per cent greater than it was before the war, to say nothing about the difficulty of getting it.

Mr. Cook: I expect the council to buy the auto-wheel.

Mr. Beales: And you expect the council to give you £20 a year for running it?—Yes.

Mr. Beales asked if it would not be better to give Mr. Cook a certain sum, and let him provide his conveyance in what way he liked?

The chairman said that Mr. Cook felt it rather hard. All other public bodies had given their employees a bonus, while they had not in any way helped to meet the additional expenditure. Mr. Cook ought to receive something, and he would like the £20 instead of an increase of salary. Would the council allow Mr. Cook £20, and let him shift for himself?

Mr. Cook: I cannot afford to buy one myself.

It was decided that Mr. Cook be allowed £20 for travelling expenses, instead of £10.

Wasted Water.—It has been reported to the water works department of the Newport (Mon.) Corporation that a considerable quantity of water is still running to waste in the town through the inability of the department to overtake the repair of burst pipes, caused by last winter's frosts.

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Decay in Timber.*

By C. J. HUMPHREYS, United States Department of Agriculture.

Decay in timber is due almost entirely to the growth of wood-destroying fungi within the tissues of the wood. There are many hundreds of different fungi which disintegrate wood in the forest, but the greater part of the economic losses in structural timber is referable to a comparatively few species.

These fungi are plants just as much as are trees and herbs. They differ merely in their form, lack of green colouring matter, and methods of nutrition. While green plants absorb their food supplies from the soil through their roots, fungi derive their nutriment from the substance of the wood.

In the life-cycle of a wood-destroying fungus there are two distinct stages: (1) The vegetative stage, consisting of thread-like, usually much branched, filaments, termed mycelium; (2) the fruiting stage, which is nothing more than a compact mass of mycelium which takes on a definite form on the surface of the decaying timbers and serves for the production of spores, and hence the propagation of the species.

Usually mycelium is confined within the wood substance, the fine cotton-like filaments ramifying throughout the tissues and filling the pores of the wood and the cells of the pith-rays, as well as boring through the walls of the wood elements. It can roughly be compared to the root system of ordinary plants, for its function is the same, namely, that of an absorbing system.

CONDITIONS ESSENTIAL TO MYCELIAN GROWTH.

In addition to available food supplies derived from the wood constituents through organic action, fungi require certain essential conditions for their development. These are: (1) sufficient moisture; (2) at least a small amount of air within the wood; and (3) a suitable temperature.

A suitable amount of moisture is, without doubt, the most important factor in decay. The different wood-destroying fungi appear to have their own particular minimum necessary to fulfil growth requirements. Certain ones classified as "dry rot" organisms seem to get along on a comparatively small amount, while others thrive only in highly humid surroundings. In the case of "dry rot" fungi it appears to be more a question of the ability of the organism to tolerate dry conditions, or to produce their own moisture from the wood than any essential need for such conditions, for observations and laboratory tests demonstrate that an increase in the moisture under such circumstances leads to more rapid decay.

The need for at least a certain minimum of water is well shown under practical conditions. The points of failure in ordinary dry buildings are the points at which a little extra water is brought to, or held within, the timbers; for example, the ends of joists or girders set in brick or concrete walls, outer window casings, wood surrounding water pipes which may sweat or occasionally burst, porch floors and ceilings, and other exposed trimmings where atmospheric moisture may collect at the joints, and last and often most important, basement timbers, either in contact with or close to moist soil.

Most people are familiar with the way in which posts and telephone poles rot at or near the ground line. Below the ground line the sapwood completely decays, while above the ground line a thin shell of dry hard outer wood remains, with the decay running up beneath it. This is entirely a result of moisture conditions. The same phenomenon often occurs in water tank staves where the outer face is too dry and the inner face too wet to decay, while an intermediate zone may completely disintegrate.

AIR ABSOLUTELY NECESSARY.

A certain amount of air within the wood is absolutely necessary for decay. The organisms need it for their growth. In saturated wood the air is, for the most part displaced by water and fungus growth is impossible.

The very widespread idea that decay is due to alternate wet and dry conditions has developed through observation of the way timbers behave when exposed to the elements. Take, for instance, a railway sleeper partly embedded in soil. During a dry season it may dry out to such an extent that decay is very slow; then come the rains, and if only sufficient water falls to put the sleeper in a good moisture condition it begins to rot rapidly again, and will continue to do so as long as the moisture and temperature are favourable. If, on the other hand, there is a long-continued rainy period, the sleeper may soon become saturated and decay will stop again and remain practically at a standstill until the stick dries out sufficiently to admit the necessary amount of air. Thus, in the alternation of wet and dry conditions, one gets at some points intermediate between the dry and wet ranges a condition at which decay is at its maximum. If the timber were maintained at this optimum point, decay of the stick would be at its greatest and the alternating wet and dry conditions would be unfavourable. It is only under fluctuating natural conditions that alternation becomes of advantage.

The third essential condition for rapid fungous growth is a suitable temperature. For the majority of species the most favourable temperature lies between 75 and 85 deg. Fahr.

The fact that all the species of fungi occurring naturally in a given locality can withstand the most severe winter weather shows their extreme hardiness to low temperatures. While growth may be almost completely suspended under these circumstances, the organisms will normally recover their growth capacity soon after being placed under more favourable conditions

As a rule, light exerts a retarding effect on mycelial growth. This may amount to as much as an 18 per cent reduction.

VITALITY OF MYCELIUM.

Mycelium in wood is often very long-lived in timber dried in the air at moderate temperatures. Once it gets well distributed throughout the wood it is doubtful, in very many cases, whether the wood can again become free of infection as a result of natural atmospheric conditions. One case on record shows that a stick infected with one of our common species contained very vigorous mycelium after having been kept in a warm, dry room for four years.

FRUITING-BODIES.

The second stage in the life-cycle of a wood-destroying fungus consists in brackets or shelves, "toadstools," or often only compact incrustations which appear on the surface of the timber after decay has become well started. Their function is to produce spores, which are comparable to the seeds of ordinary green plants. Being very minute (finer than flour) these spores are readily carried about by air currents and lodging on the surface of moist timber, at a favourable temperature, germinate to produce new infections.

A large part of the infection of timbers in the open occurs through the agency of these spores, but in buildings, where fruit-bodies are less likely to develop, they play a less important role.

DECAY IN BUILDING TIMBERS.

Having now briefly reviewed the conditions which favour the development of rot-producing fungi, I will cite a few specific instances of the more serious fungus outbreaks which have come to my personal attention. All of these cases could readily have been prevented had the men in charge of the design and construction been familiar with the fundamental conditons which invariably lead to rapid decay.

The principal sources of danger fall roughly under the six following heads:

(1) Placing non-durable timber in moist, ill-ventilated basements or enclosures beneath the first floor, or laying sills in direct contact with the ground.

(2) Embedding the girders and joists in brick or concrete without boxing the ends.

(3) Placing laminated flooring in unheated buildings in a green or wet condition.

(4) Covering girders, posts or laminated flooring with plaster or similar coating before thoroughly dried.

(5) General use of non-durable grades of timber in a green or only partially seasoned condition.

(6) Use of even dry timber of low natural durability

*From a paper read before the Western Society of Engineers

in buildings artificially humidified to a high degree, as in textile mills.

A further element of danger lies in the use of timber infected during storage, or which has become infected through neglect after purchase and delivery.

POOR VENTILATION IN BASEMENTS.

A considerable number of cases where poor ventilation beneath buildings has started serious infections have come to the writer's notice. One case will suffice for illustration. It was a one-storey frame building four and a-half years old, with solid concrete foundations, except for four small screened ventilators in front about 5 in. by 18 in. in size. The building was set about two feet above the ground and the air beneath the floor was stagnant and very humid, especially at the back end, where the infection started. In the course of about three years the fungus had rotted out a portion of the floor girders, joists, and flooring. At this time repairs were made beneath the floor and also a new floor was laid on top of the old one. In less than a year the new floor and the bottom of racks resting on it were badly rotted.

EMBEDDING TIMBERS IN BRICK OR CONCRETE.

Cases where girders and joists embedded in brick or concrete walls have rotted off in a short period of time are not uncommon. The writer has investigated one case with considerable care. Heavy 12 by 20 Douglas fir girders, in a green condition, had been covered tightly with light galvanised iron at the ends and then embedded for about 18 in., without boxing, in concrete pillars at the outer walls. In about four and a-half years many of the timbers were thoroughly rotted at the ends and had to be removed. In an effort to control the rot, the concrete has been chipped away from the ends of the girders to allow them to dry. Borings taken in May, 1916 (after chipping away the concrete), in two girders between the depths of 4 and 6 in., show the following moisture percentages: 1 ft. from end, 19-20 per cent; 2 ft. from end, 14-16 per cent; 5 ft. from end, 11-13 per cent.

It is thus seen that the timbers were then in an air-dry condition at 5 ft. from the ends. Very little, if any, rot has developed at these points.

LAMINATED FLOORING.

There seems to be some divergence of opinion regarding the use of laminated floorings. In many buildings it has proven completely satisfactory. In others it has given very poor service. All the complaints investigated by the writer have shown the trouble to be due to the use of wet material. This, at best, dries very slowly in an unheated building. Covering such timber with plaster, or any other heavy coating, when moist will almost invariably cause trouble. If difficulties with laminated flooring are to be avoided, the timbers will have to be thoroughly air seasoned and kept dry during construction.

HOW TO CONTROL DECAY.

This phase of the subject can best be discussed under two main heads: 1, Prevention; 2, Eradication.

Prevention of Infection.—The possibility that timber may reach the consumer with infection already in it is by no means remote. Many timber yards are in a highly unsanitary condition as regards the presence of destructive fungi. For this reason the material should be carefully inspected and all pieces bearing incipient rot rejected. Likewise, it may prove advisable to inspect the yard where the purchase is made.

Upon delivery of the material it should not be thrown about on the ground, but should carefully be placed on skids and kept dry. The soil is often a prolific source of infection.

Such timbers as are to be placed in situations favourable to decay should either be select grades of naturally durable stock or else treated with a good wood preservative. Neither non-durable timber nor sapwood is objectionable when used in a dry condition and kept dry. Hence, every effort should be made during construction to keep moisture away from the timbers, and especially the joints.

Moist timbers should never be cased in, nor should timber of any sort be embedded in concrete or brick walls without boxing.

In all cases thorough ventilation of moist, stagnant basements should be provided.

ERADICATION OF INFECTIONS.

Whenever timbers begin to fail, the need of a thorough inspection of the building is indicated. If poor ventilation is the cause, the building should be opened up to secure rapid drying of the timbers. At the same time tests should be made to determine whether the wood contains living fungus. It is also important to know what species the fungus is, as further control measures may hinge on its identity. For instance, the true dry-rot fungus, being a low-temperature organism, can be controlled by the application of heat, while such a procedure would be useless with most other species. Some fungi may also prove susceptible to a certain amount of drying, where others would not.

Where serious and active decay exists, without the exact method of control being indicated, the timbers should be carefully removed and replaced with select durable stock or with lower grade material treated with antiseptics. Likewise all incipient infection which appears in timbers which it is not considered necessary to remove should be given two or three applications of a wood preservative. Either a hot 3 to 4 per cent water solution of sodium fluoride or a cold 1 per cent alcoholic solution of mercuric chloride is well suited to interior timbers. Exterior timbers, where odour and colour are not objectionable, can be satisfactorily treated with a good grade of hot coal tar creosote.

TESTING OF GAS.

RIGHTS OF LOCAL AUTHORITIES.

In the House of Commons the President of the Board of Trade was asked whether at a conference that recently took place between his Department, the Tottenham Light and Gas Company, and the local authorities of the districts served by the company it was agreed that each local authority might test the gas for calorific power once per day; if so, why had the Board now made an Order restricting the testing by all the authorities to once per day at each station without hearing the reasons which the local authorities desired to advance against this course; and whether, in view of the disadvantages under which consumers were now placed in the matter and quality and price of the gas supplied, the board would give them all the protection possible.

Sir A. Stanley said the gas supplied by the company referred to might be tested at three separate testing places, and, in accordance with the uniform practice of Parliament in local Acts relating to gas undertakings, the Board of Trade, in their recent Order fixing a calorific standard for the gas supplied by this company, provided that not more than one testing for calorific power should be made at each testing place on any one day. The Board of Trade did not think that, as a general rule, they were justified in imposing conditions in Orders of this nature more onerous than those imposed by Parliament on other gas undertakers in like circumstances. The representations made by the local authorities in this particular instance were very carefully considered, and the Board saw no reason to depart from the usual practice.

TOO GOOD TO BE TRUE.

The following verse, among others, was inspired by the occasion of a complimentary dinner given to President Marks, of the borough of Manhattan, by the employees of the Department of Public Works of New York City:

The pavement was finished on Broadway,
Not a cut nor a trench could be seen.
Repairs were all made, and the kerbs laid to grade;
The complaint book for months had been clean;
The sidewalks were clear of encroachments,
The taxpayer's wish was supreme—
Newspapers gave praises,
We all got good raises—
'Twas only an engineer's dream.

Housing Reconstruction after the War.—In reply to a question in the House of Commons as to whether the Sub-Committee on Housing (Reconstruction after the War) had yet reported, and, if not, when a report might be expected, Mr. Bonar Law said there was no Sub-Committee of the Reconstruction Committee dealing with the subject. It was, however, being investigated by the Local Government Board with the co-operation of the Reconstruction Committee, and although he was not in a position to say when it would be possible to make a statement, he could assure the House that it was a subject of the urgency of which the Government was fully alive.

The Future of Electricity Supply.

By F. M. LONG, City Electrical Engineer, Norwich.

[Extracts from Presidential Address delivered yesterday to the Incorporated Municipal Electrical Association.]

While the growth and development of the supply of electrical energy has been marked all through by steady progress and increasing spheres of usefulness, at no time has the development or the service rendered to the community at large by the supply undertakings in the kingdom, and especially those owned by local authorities, been on so large a scale as in the last two years.

It may be stated as an undisputed fact that the ability to meet the great demands for power has been an important factor in the production of the vast quantities of munitions required for the war.

One has only to contemplate what would have been the delay and the capital outlay necessary, to say nothing of the increased consumption of coal and extra operating staffs required, if individual works had been obliged themselves to provide the additional power they required, in order to realise the enormous benefit derived from the existence of the electricity supply undertakings of the kingdom.

The increase in the output of some undertakings has been altogether unprecedented, and has only been accomplished by the greatest efforts on the part of those responsible, working under very adverse circumstances.

Many stations have been running up to the hilt without any spare plant whatever, and it is a matter of great concern to such undertakings as to how the next winter's loads are to be met. The most serious difficulty appears to be as regards boilers. A turbine may run for a long period without requiring any repairs, but unless boilers can be taken off regularly for cleaning and inspection trouble is bound to ensue. It is impossible to express any opinion as to the restrictions on the supply of new boilers to municipal undertakings, and one can only draw attention to the risk that is being run.

FUTURE DEMANDS FOR POWER.

Great as has been the recent development, I think we may look forward to still further demands as soon as the war is over.

It seems inevitable that at the close of hostilities there must be some falling off in the demand for power, but with the vast arrears of industrial work to be made up, and the great demands there will be for making good the ravages of war, this, we may anticipate, will be only for a short period while reorganisation takes place. Not only the long established works, but also, we may anticipate, the great works especially erected for turning out munitions, will take power for peaceful industries. The war has already given a great stimulus to the utilisation of electrical energy in processes which before had been very little developed in this country, among which the following may be mentioned.

ELECTRICITY IN AGRICULTURAL AREAS.

Over and above the development of industries as above, which for the main part concern the larger towns, there is the question of the development of the use of electricity in agricultural areas, which is a matter that concerns small as well as large undertakings. The question is one of national importance. The country has at last realised the necessity of paying attention to agriculture, and of getting as much out of the land as possible. This involves the further use of power and the improvement of the conditions of country life. The fixing of minimum prices for wheat and oats and for labour will go far in effecting this and in giving security which must result in much greater prosperity but electricity at given full scope will be of enormous assistance. It is the only means by which power, lighting, heating, and electro-culture can all be supplied.

It is true that steam and petrol are largely used for power, but as the writer has had experience with electric motors would use anything else if electricity were available, and there are some operations, such as dairy work, where petrol or oil engines are entirely unsuitable.

That also a supply of electricity in villages would add enormously to the amenities of country life, not only in improved lighting, but also in rendering possible the use of the cinematograph, a small matter perhaps, but not unimportant in view of the strong attractions offered by the towns.

Electro-culture is a matter of very great importance. It has shown such results in the experimental stage that there can be no doubt that when it is more fully understood it will be a factor of enormous benefit to the country. Though the actual amount of energy required is very small and could be supplied in other ways, the existence of a supply of electrical energy at hand will make a very great difference in practical working.

The use of electricity for light railways, for canals, and for charging electric vehicles are also matters which may become of great importance.

The problem of supplying such areas is a large one, and many difficulties will have to be faced. To bring electric power within the reach of all possible users in the country involves an extensive system of overhead wires. This, however, must be a matter of development, the natural course of which would be for lines to radiate out from existing supply stations. It must necessarily be many years before it will be feasible to run bulk supply mains from stations in the coalfields to supply such areas as, say, the Eastern or Southern counties, and until such time these areas must depend on such supply stations as already exist, as the erection of special plant to supply agricultural districts is out of the question.

It is a matter, therefore, that should appeal to those local authorities owning supply stations so situated, as they, and they alone, can give these facilities.

Setting aside for the moment the questions of obtaining power, and of wayleaves, which I deal with later, there is the outlay to be considered. This, for supplying any large area, might be more than a small town could take responsibility for, and means would have to be found for dealing with it. Small extensions, however, could well be made, and what has been done at Hereford could be done elsewhere. This would prepare the way for further developments later on. What is wanted now is that each undertaking should investigate this problem and prepare a scheme which could be put into effect after the war is over. It is most desirable, however, that there should be uniformity as regards system, in view of possible linking up or bulk supply later on, and it will be one of the functions of the committee appointed by the association to standardise methods of distribution and appliances.

WAYLEAVES AND OVERHEAD LINES.

The questions of wayleaves and powers to run overhead lines are recognised as vital to the development and supply of cheap power, and though hitherto of more concern to power companies, they are equally important now to municipal undertakings, in view of linking-up and the supply of rural districts.

The matter has been very fully discussed recently, and the anomalies and difficulties of the present conditions very ably set forth, so that it is unnecessary to deal with them. While there is no desire whatever that an owner or tenant should suffer loss or that the amenities of ornamental parks or grounds should be interfered with, it is essential that there should be power of appeal against arbitrary refusal or exacting charges where a proposed line can be shown to be of public utility. The drastic steps, in curtailment of private rights, that have been taken under the Defence of the Realm Act have accustomed us to the principle that national interests must have prior claim, and this should very much facilitate the granting of the powers sought.

Powers for joint working of undertakings, whether municipal or company, are desirable and necessary in view of the advantages that can be derived from linking-up where the conditions are favourable, and the granting of such powers is not likely to give rise to difficulty or opposition. The exercise of such powers is, however, another matter, and one fraught with far-reaching effects. The drawing-up of agreements so that the benefits to be derived from joint working may be fairly proportioned between the several parties will

call for much skill and foresight, combined with a spirit of fairness and mutual regard.

METHODS OF CHARGING.

The question of methods of charging is one that needs to be put on a more definite basis. It has been found necessary, in order to extend the use of electricity for all purposes, to differentiate between charges for supplies for light, power, heat, &c., as well as to devise special methods of charging, the validity of which can only be settled in a court of law. This is not satisfactory, and it is proposed that power should be given to the Board of Trade to approve methods of charging, whether for energy supplied, stand-by supply, or other services rendered. Such methods would then have legal authority, and opportunities for vexatious litigation would be removed.

DUTIES OF LOCAL AUTHORITIES.

I have endeavoured to indicate the increasing demands for electrical energy that may in the very near future be expected, extending to all classes of undertakings, also the assistance that may be looked for from Government action in the furtherance of the development of the industry, and it only remains to emphasise the necessity of all undertakings using their best endeavours to meet these demands, and to supply at the lowest possible cost.

Cheap electrical energy is an absolute necessity, not only for the successful development of such industries as those employing electric furnaces, but also for power, if the manufacturers of this country are to hold their own in the keen competition for the world's markets after the war. Cheapness is, however, a relative term, and it is not the actual figure at which electrical energy is sold which signifies so much as the cost in comparison with other sources of energy. Prices will in all probability be on a higher basis everywhere after the war, and we need not, therefore, worry about the extra price of coal, or grudge the higher wages and salaries which must be paid. The important point is to attain higher efficiency in the utilisation of coal and in the output of machinery and individuals.

LONDON "SAFETY FIRST" COUNCIL PROPOSALS.

PROTECTING THE PEDESTRIAN.

At a meeting of the London "Safety First" Council, held on Wednesday in the Council Chamber at Westminster Guildhall, the question of the position of lamp columns, sand bins, pillar letter-boxes, trees, tramway standards, gantries, &c., in the thoroughfares subjected to heavy and continuous traffic was discussed, and the Street Dangers Committee advised that these erections should not be placed nearer to the kerb than 2 ft., except in suburban roads and thoroughfares of a residential character, where the traffic is intermittent and local. It was pointed out that the retention of this minimum distance would secure the safety of pedestrians from accident from falling lamps, and danger from excessive or encroaching traffic.

The same committee also reported that they had considered a suggestion that all private carriageway entrance crossings over footways should be constructed without step-kerbs on the line of footway, and recommended that this method of construction should be adopted where circumstances permit, and could, with advantage, be also carried out as the necessity of reconstruction arises. They further stated that they approved another suggestion that street refuges and other obstructions in the centre of roadways should be properly lighted, and, upon their recommendation, the council resolved to invite the consideration of the local authorities in the Greater Metropolitan area to these matters, and also to suggest to the tramway authorities in such area that stopping-places for tramcars might at night be indicated by coloured illuminated signs.

Glasgow Tramway Profits.—The accounts of the Glasgow Corporation tramways for the year to May 31st show a revenue of £1,260,115, an increase over the previous year of £102,779. The feature of the accounts is that after meeting all expenditure, including over £92,000 in war allowances to dependents and war bonuses to employees, there is a surplus of £160,984 to be handed over to the Common Good Fund of the corporation, as compared with £43,5[illegible] for the previous year.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not evident that the promiscuous destruction of house refuse by burning will not long continue as the only proper means of disposal? Do we not read that almost everywhere a more or less systematic sorting of materials is now taking place, and that surveyors are constantly reporting that a considerable revenue is now being derived from the sale of waste paper, bottles, &c.? When will the treatment of house refuse be tackled on a large, comprehensive, and scientific scale?

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Was it not rather depressing reading for consulting engineers in this country to read in THE SURVEYOR of the 15th inst. Mr. H. T. Rolfe's recent speech when moving the annual report of the Association of Consulting Engineers? Is it not evident that the war has hit this class of professional men more than any other, and that unless he has been fortunate enough to secure service under the Government, a man can only "hang on" until better times? Could not the Government make more use of the brains of these engineers than they have done in the past, and employ them in suitable positions, provided that age or some infirmity incapacitated them from serving their country in the field?

* * * *

Amongst the papers which are to be read at the annual meeting of the Institution of Municipal and County Engineers next week, at Hastings, will not the one on Extraordinary Traffic, by Mr. Wakelam, raise considerable interest in view of the damage now being caused to our roads by the haulage of timber and other materials, which has increased abnormally owing to the war? Would not a pronouncement by the Government as to what they propose to do in the way of payment for the damage thus caused to the roads be hailed with satisfaction by local authorities throughout the country?

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Is it not to be regretted that there was not a larger attendance at the meeting at Worcester of the West Midland District of the Institution of Municipal and County Engineers to hear Mr. Caink's account of the activated sludge process which has been so successfully in operation there for more than a year? Is it not evident that this process has almost exceeded expectations, and that it bids fair to become the treatment of the future? Was it not a testimonial as to the absence of nuisance when we find that those present at the meeting partook of their tea close to the tanks, and were in no way inconvenienced?

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Would it not be a great help to the general public if some enterprising publisher would issue a directory giving the titles and addresses of all the Government departments and committees which now exist, with a ready reference to the subjects in which each department or committee is interested? Is it not now almost impossible to make inquiries as to the various restrictions which are imposed on certain trades and professions, or to ascertain to what department or official any breaches of orders or other matters which come to the cognisance of anyone anxious to assist the Government should be communicated? Is not the present confusion in these subjects very detrimental to the best interests of the country? For instance, who is one to write to when one receives by post a huge catalogue for which one has made no application?

* * * *

Is it not rather remarkable to read that in the construction of the Calaveras, California, earth dam, which is claimed to be the highest of its kind in the world, with the aid of hydraulic machinery, the work of one man for one day excavated, carried 1,000 yards, and dumped into place no less than ninety cubic yards of soil? How many cubic yards could a man handle in this way per day without the aid of such machinery?

Errata.—In the Note of the case of *Critchlow* v. *Doncaster Urban District Council*, in the Law Notes section of last week's issue, at p. 556, in line nine, for "nursery" read "tannery." In reply to query by "C. V.," on the same page, in line twelve, for "requires" read "acquires," and in line thirteen for "required" read "acquired."

House Refuse: Its Calorific Value and Its Possibilities.*

By REGINALD BROWN, M.INST.C.E., M.I.MECH.E., F.S.I., F.R.SAN.I., &c.

[*Concluded from last week.*]

We now come to the second part of our subject, the use of the calorific value. At the present moment one need only refer to "destructors," but here the "heat" is only used in certain cases, and then with not altogether satisfactory results. The destructor, *per se*, is a sanitary adjunct to a district, and in many instances is the only method, up to the present, open to local authorities for the effectual disposal of the refuse collected in their district. Accepting that destruction by fire is the acme of sanitary efficiency, then if the modern destructor was as economically efficient, there would remain little to be said, but the evidence is all to the contrary; but, then, what is meant by economical efficiency? Evidently a large number of sanitary authorities and their technical advisers are of opinion that the destructor is not an economical method of disposal, otherwise we should not see so many authorities without such an adjunct even in the Metropolis. It seems, however, to be the only avenue open to them (at the present) when the disposal by barge, rail, and such-like becomes, in their opinion, more expensive than destruction by fire.

The erection of a destructor is, however, put off as long as possible, and one cannot wonder at this when the cost per ton of refuse burnt—including buildings, &c.—reaches anything between 3s. 9d. and 5s. This figure is a dead loss—in some people's opinion. It is not, however, a dead loss; rather call it the cost of disposing of house refuse on sanitary lines for the benefit of public health generally. When there is an opportunity of utilising the waste heat from destructor furnaces for any useful purpose, then the returns from such a source is a "set-off" against the cost of destruction. The author is not, here, going to enter into any discussion as to the actual value from a "heat" point of view of combined works, but the existence of such combined works is evidence of the fact that such a value exists. It is certain, however, that the full value of the refuse is never credited to it, and when one sees that 1s. per ton is the only sum credited for steam purposes it makes one wonder how such a figure is arrived at; in fact, the author knows of one case in which 1s. per ton is allowed, while as a set-off 3d. per ton is charged for electrical power used by the destructor department, so that the nett result is 9d. per ton, but even this is better than another case within the author's knowledge, where ¼d. per ton is the only nett result, it costing 11¼d. out of every shilling for electricity supplied to the destructor plant. Such figures as these make one hesitate to believe that "house refuse" is being treated quite fairly—or, rather, is being used in such a manner as to get the best results.

FUEL FROM HOUSE REFUSE.

The author is quite aware of the many difficulties in the way—under present conditions. A few of the difficulties may be mentioned here, because they could be considerably modified or entirely removed by what is to be stated hereafter. These difficulties are the provision of a sufficient number of cells to deal with the refuse directly it reaches the works; the utilisation of the waste heat for useful purposes being subordinate to the necessity of securing absolute and perfect oxidation of all combustible matter; the varying quality of the refuse, the non-uniform rate of delivery, the physical characteristics of the refuse; the necessity of using an excess of air over that required for combustion. The question is, Can the calorific value of the refuse be conserved and utilised without endangering its sanitary disposal?

The author is of opinion that the answer is in the affirmative, and the goal can be reached by the conversion of the refuse as soon as received at the disposal works into a form which shall in its conversion be void of nuisance, and also may be stored for any length of time without any fear of a nuisance arising, and further may be used as a fuel at any time and either on the site or at any place remote therefrom—in other words, to convert it into [illegible] and at the same time conserve its calorific value, and, incidentally, in such conservation to reinforce the refuse with other material so as to increase the calorific value to any desired standard. The objection will probably be raised that, even if local authorities can make such a fuel, they would not be permitted to sell it. Well, all the author can answer to such an objection is—local authorities *must* have the power granted them, and they can have it if they so desire. In those towns which have not their own sewage disposal works it would be folly to "convert" without the power to "sell," unless they have other means of consuming the whole of the fuel manufactured. Of course, such an objection cannot be raised where the disposal is carried out by a private company, and this will have to be done if needs be. Where sewage disposal works exist there is no difficulty in using all the fuel made, especially where companies carry on the work, as will be seen hereafter.

THE AUTHOR'S PROCESS

Acting on advice he has received, the author has delayed publication of Letters Patent for his invention for the production of a fuel from house refuse, as such publication might affect the foreign rights, and hence it will be delayed pending the author's decision to proceed. In passing, it may be stated that there is strong evidence of the necessity of such a process, as since the matter was first mooted inquiries have been received from all parts of the world. The author must therefore be pardoned for not, at the moment, giving full details and claims of his process (for the above reasons only), but he is quite at liberty to give a brief outline of it.

It consists of three operations—(1) Crushing, (2) briquetting, and (3) impregnation. After the preliminary removal of metal and such-like, the operation of crushing reduces the refuse to a powder; this is immediately made into briquettes which can easily be handled without fear of being altered in form, and by reason of the nature of the material they soon become dry enough for impregnation, either by simple dipping or under pressure. The dipping or impregnating mixture varies, according to the refuse to be treated, and not only permeates the whole thickness of the briquette, but also acts as a permanent binding material. The whole process is extremely cleanly and simple, and the production of the briquette in the manner described gives the enormous advantage that the moisture is removed *before* the addition of the binding material—an important point recognised by those who know how difficult it is to mix wet crushed refuse with even hot tar or pitch, or both.

In the author's process the house refuse can be dealt with as soon as received at the disposal site, and converted into a form which can be stored without any fear of a nuisance arising, and, what is just as important, can be used as a fuel *as* required, *when* required, or *where* required. Obviously the process is a competitor with the refuse destructor, and bids fair to be a severe competitor when it is in full working order, because it is utilisation, and not destruction. The sanitary efficiency of the process cannot be questioned, as the impregnating material absolutely prevents any nuisance arising, the whole of the calorific value of the refuse can be utilised, and can be reinforced to any degree required, and the process is economical. Including the cost of buildings and plant, the fuel can be manufactured for 7s. 6d. per ton; but this will, of course, vary with the degree of reinforcement desired, and the author has strong reasons for believing that the fuel will fetch 10s. per ton at least. He, however, prefers to put it in this way: House refuse has to be got rid of, no matter at what cost, and if a local authority has any difficulty in disposal they turn to the refuse destructor as a solution. Now, "destruction by fire" costs anything between 3s. 9d. and 5s. per ton (including buildings and plant), with very little, if any, hope of recovery of the calorific value of the refuse. Assuming therefore the cost of the fuel when made to be 7s. 6d. per ton, this will represent 3s. 9d. more than it would cost to destroy by fire—assuming destruction at 3s. 9d. per ton—so that, if the fuel was sold at 3s. 9d. per ton only, the cost would not exceed that by the modern destructor, and obviously any

* Paper read on the 6th inst. at a meeting of the Institute of Municipal Engineers held in London.

figure obtained above this would react in favour of the conversion method. In addition to this, the material is being "utilised," so that "economy" is stamped on its face.

A SLUDGE FERTILISER.

There are, however, greater fields to be tilled. The question of "fertilisers" for the land is a very big problem to solve, and as there is an intimate connection between that problem and the author's process, it will, it is hoped, be of interest to give his views on the matter. One need not go into the enormous quantities of "sludge" which have been, and are accumulating at sewage disposal works all over the country; the fact remains that the problem of disposal of sewage sludge requires a solution, and if a ready means can be found of converting this "sludge" into a useful fertiliser, there is a wide field open to its use. That sewage sludge has fertilising properties is proved by the material being made under the name of Native Guano and Globe Fertiliser, and the call for these manures is evidence of its ready sale at a good price. One of the reasons why this has not been carried out on a large scale is the want of organisation on a large scale; but the *chief* reason has been the absence of a *cheap* means of drying the sludge. That such means are necessary for success is proved by experiments carried out for the Board of Agriculture at the Manchester University by Mrs. Mumford, the results of which were published in the Journal of the Board in May, 1916.

The author claims that with fuel made from house refuse the problem is on the way to a solution. In all towns house refuse has to be disposed of; *almost every* town there is also the sewage sludge to get rid of, so that the utilisation of the one will create a new value in the other. The author therefore suggests that every town has now at hand a ready means of not only disposing of the house refuse on very economical lines, but also of utilising the converted refuse for drying the sludge produced at their sewage works, thereby producing, at a big saving to the ratepayers, a decent fertiliser. Of course, some districts—such as those in the Metropolis—have no sewage disposal works of their own where the converted house refuse could be utilised in the manner described, but such districts must form constituent authorities of joint sewage disposal works, and could, if they have the desire, dispose of the fuel to those joint works, so that the waste of each constituent authority could be made to react for the benefit of the whole. The tapping of a new source of fertilising material on a large scale, would also meet a national necessity.

What think the members of this Institution to such a future? Is it worth striving for? There can only be one answer. It need only be mentioned further that, although in the process of conversion of house refuse into fuel the organic and vegetable matter are prevented from becoming a nuisance, the chemical composition is not altered, so that the ash from the fuel still retains the principal constituents of "plant ash," and hence if burnt for drying the sewage sludge can with advantage be added to the dried sludge, and so enrich same. The solution of the two problems is therefore, the author suggests, found—the house refuse is treated on sanitary lines; it is converted into a useful fuel; it can be utilised as such whenever it is required; it is a ready and a cheap means for drying all the sewage sludge produced at a sewage works; it makes it possible to dispose of all sewage sludge as a fertiliser; it makes it possible to enrich the fertiliser; and when not required for drying, sewage sludge can be used as a fuel for steam raising and other purposes, and so assist in conserving the output from the coal mines.

"NO STATUTORY AUTHORITY."

With all these advantages, you will be wondering why, if all this is true, the process is not in full swing all over the country. The author anticipates such a question, and he is quite prepared to satisfy you on the point. The first reason is, we are a very "conservative" nation, and any new processes are looked upon askance until they have been proved a commercial success; but, in passing, it might be asked, Was such required when destructors were proposed? Not a bit of it. The chief reason, in the author's opinion, is that of the vexed question of "municipal trading;" but surely it is not sound policy to give a "blessing" to any process which can only be a source of expense to the ratepayers and a "curse" to any other process which is "economy" to a community. Such a position is wholly untenable; but still the fact remains.

The author is not putting forward "municipal trading" wholesale, but he does claim that a local authority should be permitted to do all things necessary with a material which is now a source of expenditure out of the public purse, to recover the inherent value of that material, even though it may mean municipal trading in a limited form. The Local Government Board, however, states that no "statutory authority" exists for such a proposal. As to what this does or does not mean the author is not competent to form an opinion; but, on the face of it, there appears to be no "statutory authority" to be economical, while there is "statutory authority" to spend money on things for which there is no hope of return.

What a position to be in! If any benefits are to be derived the ratepayers ought to have those benefits—at least that has been the author's opinion; but therein lay his mistake; he has been unable to ascertain, after several months, what is meant by "no statutory authority," and he questions very much whether, until the process is placed in private hands and private companies reap the benefit of their industry and foresight, instead of the ratepayers, any move will be taken to secure the necessary "statutory authority." This and other obstacles have prevented a complete plant being put down up to the present, and hence the work has had to be done piecemeal; but the exhibit shown this evening illustrates, to some small extent, what can be done with the process described. The author feels sure that the members will realise that what can be done by hand—as the briquette exhibited—can be done, and done better, by machinery; the complete idea is there, so that "he who runs may read." He hopes, however, that before long private enterprise will enter the field—which will not require "statutory authority" to trade, and in this way show to municipalities that it is their duty to urge upon Government Departments to give them powers to not only "preach" but to "practise" ECONOMY.

THE TRIBUNALS.

At the Lewes Tribunal the East Sussex County Council asked for the conditional exemption of an engine driver, twenty-five, C 2. A representative said the man was wholly employed as engine driver. Conditional exemption.

At Hove, in the case of a dustman (thirty-two, B 2), attention was called, on behalf of the employer, to an official circular which stated that the intention was to place dustmen passed for a lower military category than B 1 in a certified occupation. Three months were ordered.

At the Brighton Local Tribunal on Monday the corporation claimed four tramway motormen. Their ages were twenty-five (sedentary work at home), thirty-four (labour service abroad), and two thirty-five (labour duty at home). It was stated by Mr. Marsh that the use of trams was increasing, and attention was drawn for instance to Sunday evening pressure. Sir John Blaker (chief military representative) contended that in times like the present they should not cater for this traffic; people ought to walk more. It was said that between forty and fifty old soldiers had been taken on and trained, but the larger proportion had dropped out, in some cases when the novelty had worn off, but chiefly on account of physical incapacity. Everything possible had been done to employ women. There were sixty-three motormen, and fifty-eight of these were required to maintain the regular service, of whom many worked seven days a week. The tribunal (the *Sussex Daily News* reports) adjourned their decisions to consider the claims when cases of other employees came up for review in July.

The Ministry of Health. The Chancellor of the Exchequer, replying to a question in the House of Commons on Tuesday, said he was not in a position to make any statement about the establishment of a Ministry of Health. Asked whether Lord Rhondda's statement that a Ministry of Health was about to be established was not correct, Mr. Bonar Law said he had not noticed that statement. He knew his noble friend had been working in the matter, but the Government had come to no decision, and it was not possible for them to introduce legislation this session.

Correspondence.

Εἰς ἀνὴρ οὐ πάνθ' ὁρᾶ.

(One man does not see everything.)—Euripides.

AIR RAIDS AND HOUSING.

To the Editor of The Surveyor.

Sir,—It is evident that air raids will increase in severity as machines are constructed of greater and greater speed, and that the bombs they can drop are becoming more and more powerful in destructive force. It is all very well to talk of warnings and notices of the approach of these monstrous engines of destruction, but they can scatter in any direction they like and take only five minutes to cover ten miles.

It would be necessary to warn every house within a fifty miles radius at least to do any good; and just imagine what this may mean! Every description of industry would be paralysed till the danger was over, and the loss in time to the nation would represent millions of pounds a year. There is plenty of time to take shelter if people would only do so when they hear the explosion of the first bomb or the sound of the anti-aircraft guns. But where are they to take shelter in the majority of cases? Our houses appear to afford no protection; the bombs now employed wreck an ordinary house or building in a second; and if shelter has been taken in a basement—if there is one—and the house falls on the top of it, the occupants may be imprisoned and slowly die from want of air.

But this is not all. It is evident that the wars of the future will depend largely on air raids, and it is impossible to predict to what extent these infernal machines may develop. The country which has the largest and most powerful aeroplane fleet will be able to enforce terms on any country that cannot repel their attacks, for the simple reason that they will be able to wipe out the whole population. This is as certain as the fact that scientific progress has no limit, and is not a wild fantastic idea any more than the late Lord Roberts' prediction that Germany would soon make war on us, a warning which we, in our foolishness, laughed to scorn.

The Americans already realise this, and are now spending £133,000,000 on the construction of aeroplanes.

How, then, is this imminent danger to be met? There are only three ways that appear to be possible. First, to be prepared with an enormous fleet of faster and stronger machines than any other in the world. Secondly, to live underground or to have an immense number of sunk shelters. Thirdly, to construct in the future only buildings that shall be bombproof against the largest and most powerful bomb that can be constructed.

It has been clearly proved by the recent raids that well-constructed reinforced concrete roofs have successfully withstood the disrupting effect of some of the bombs dropped on to them, and this should show us that a strong building of this description of material will have to be a model of the house of the future.

Your readers will probably laugh and call this communication nonsense, but history repeats itself, and solemn warnings have been laughed at before, and those who laughed have sometimes lived to repent, although more often they have gone before the prediction at which they scoffed became true. Man has at last conquered the air, and the whole face of the world will, no doubt, be changed thereby. It is for man to prepare himself for this change.—Yours &c.,

H. Percy Boulnois.

June 18, 1917.

CHLORINATION OF WATER.

To the Editor of The Surveyor.

Sir,—We have read with interest the opening article of your editorial pages of the 8th inst. and consider that it is likely to serve a very useful purpose in drawing the attention of municipal officials to the advantage, from economic as well as hygienic points of view, [illegible]

We have had now in connection with our work for the British Army considerable experience of this process (particularly as to operation by means of pure liquid chlorine as against the expedients referred to in your article) and with one quotation in your editorial as to the [illegible] agreement, namely, that "the shorter the contact the greater must be the excess."

De-chlorination has been recognised for some time as essential in cases where medium or heavy doses are necessary; but it is only within recent period that de-chlorination by means of liquefied gas has also been carried out; the gas so far being employed is sulphur-dioxide (SO_2).

This dual gas process for sterilising water may be considered the last word at this date in connection with such work, and affords an opportunity for treatment of water with doses of chlorine which was never before available, sterilising it against B. coli without any trace of chlorine being in the water finally distributed, and without the attendant undesirable flavour.

The process is one which has also the advantage of employing reagents which at all times contain 100 per cent of the active element, as against the hypochlorite system, the percentage of the active element of which varies from 10 to a maximum of 30 in most cases, and involving the making up of solutions with the apparatus necessary. In the dual gas system the treatment without any interfering of mains pressure is also feasible.

It may be that an article which appeared in the *Engineer* for March 16th last came under your notice. This described at length the only apparatus which up to the present time can be regarded as thoroughly successful from all points in the administration of chlorine gas direct into the water supply; the same apparatus, with slight modifications, is supplied in connection with the de-chlor. gas, and affords a further stage in the process, of equal efficiency.

May we, in closing, draw your attention to what appears to us to be a slight error in your editorial? Towards the foot of the first column the dose in connection with London water is stated to vary between one part per million and four parts per million, with the average of two parts per million; we think your intention was to indicate this as ranging between one part per million, one part per four millions, with an average of one part per two millions.—Yours, &c.,

United Water Softeners, Limited.

June 11, 1917.

[As regards the dose in London water, this was, of course, a slip.—Ed. Surveyor.]

DAMAGE TO ROADS BY TIMBER TRAFFIC.

To the Editor of The Surveyor.

Sir,—I have been much interested in previous correspondence on this matter, and perfectly agree that this question is being felt rather hard by many rural districts of small rateable value.

My district in particular has been unfortunately blessed with this unforeseen traffic, but it has been my council's course to adopt the best methods to counteract this damage.

The hauling of the timber is being done for the Home Grown Timber Committee (War Office) by several contractors, who have been wise enough to be indemnified against all claims for extraordinary traffic. In view of these facts the whole responsibility must obviously be shouldered by the Home Grown Timber Committee.

Immediately I ascertained these facts my council instructed me to ascertain who would deal with the matter. Ultimately we found that the Road Board dealt with the whole of these claims, and I can conscientiously say that the question of damage has always been considered in a fair and impartial manner, and, from our point of view, we have not the least cause for complaint.

Assuming, however, that the private contractors are not indemnified against all damage, the only open course is to sue these people for the damage, as it seems perfectly clear that the contractors' price for hauling the timber embodies a reasonable margin for outside contingencies, such as extraordinary traffic to roads. Then why should the rural authority have to bear the brunt?

My opinion is this, that the matter should be taken in hand at the commencement and a periodical claim made as to the extraordinary traffic done, taking into view the Highways and Locomotives Act,

which I perfectly agree is naturally complicated. If in the opinion of the surveyor the question is clearly one of extraordinary damage, then why fear?

I perfectly agree with Mr. Haworth that the County and Rural District Associations could render great assistance, especially in complicated and doubtful cases.—Yours, &c.,

K. George Foster,
Surveyor, St. Germans R.D.C. (Cornwall).

June 15, 1917.

BRUSHWOOD AS A MEDIUM FOR SEWAGE FILTERS.

To the Editor of The Surveyor.

Sir,—From the article in The Surveyor of March 9th last on "Brushwood as a Filter Medium for Sewage Filters," by Mr. George Phelps, it would appear as though the brushwood filter was only "the outcome of previous experiments with a lath filter" and had not been suggested by me.

In order to remove any misapprehension on the point I would like to state that prior to the North Toronto installation the process had already been patented by myself; that the installation of a brush-filter was already in hand at the Morley Avenue experimental sewage disposal works; and that the conversion of one of the North Toronto stone trickling filters into a brushwood filter was made at my request by the Commissioner of Works, Toronto, to be operated as an experimental filter to obtain scientific information.—Yours, &c.,

Geo. G. Nasmith,
Director of Laboratories.

Toronto,
May 23, 1917.

"CARRYING ON" WITH DEPLETED STAFFS.

To the Editor of The Surveyor.

Sir,—The writer is the surveyor of a small but expanding borough, who, owing to the war, is left practically singlehanded in the office, and having all departments under his charge—surveying, sanitary, cleansing, lighting, water, &c.—is finding it difficult to keep the office work up to date.

Will any of your readers advise as to the best methods of keeping documents relating to the various departments, so that these can be readily got at when wanted—some system (card index or other) that could be handled by an intelligent girl?

Is there any manual published that would be of use?

18th June, 1917. Overworked.

ROAD REPAIRING IN WAR TIME.

On Monday, in the House of Commons, Sir Samuel Roberts asked the Secretary to the Local Government Board whether, in the opinion of his Department, the repairing of the roadways of Eccleston-street and Chester-square was a work of national importance; and, if not, whether the Westminster City Corporation would be restrained from employing on this and similar operations numbers of able-bodied men whose labour is wanted for vital purposes connected with the war.

Mr. Hayes-Fisher: I have no reason to suppose that the Westminster City Corporation is not alive to the need for reducing the work of road maintenance to the minimum compatible with public safety. They have, I believe, largely reduced their expenditure in this direction.

Sir S. Roberts: Will the right hon. gentleman kindly have that question and reply sent to the corporation?

Mr. Fisher: I will gladly draw the attention of the corporation to the question and answer, but the Local Government Board have no legal power in the matter.

Wages of Edinburgh Municipal Employees.—Sheriff Louttit Laing, who acted as arbitrator in the application by the Edinburgh Corporation workers for a wages increase of 10s. per week, has issued his award. He grants the demand. The rate of 10s. is an advance on pre-war scale. Some of the workers have already received either additions to their wages or a war bonus, and the new increase will vary accordingly from 2s. per week up to 5s. The award does not apply to certain employees in special positions, who receive a general flat rate.

DUNDEE'S PROPOSED WORKING-CLASS DWELLINGS.

PROSPECTIVE TENANTS AND THE PLANS.

Following upon the preparation recently by the city architect, Mr. J. Thomson, of plans for houses for the working classes of Dundee, a full-size model dwelling was erected in Dudhope Park in order that the townspeople might have an opportunity of passing judgment upon the design before the work of erection was proceeded with. In ten days no fewer than 19,603 persons had made an inspection of the model, and 132 people had intimated their desire to secure such a house. Oral criticism had been most favourable to the general design and equipment, and many women had expressed the desire that no time should be lost in the erection of the houses, so that their husbands, on returning from military service, would be able to get a house of that type. Most of the written criticisms had reference to the amount of shelving, the position of the coal bunker and gas cooker, the size of the bedroom, the want of a back door, &c. The points on which there appeared to be the greatest divergence of opinion related to the want of a lobby and bath in the house. One individual wrote: "Scullery much too small," and another, "The kitchen-scullery is a treat." Still another said, "Of no practical use for a man with a family," to which another reply was pat, "Most suitable every way."

It is now announced by the *Dundee Courier* that Mr. Thomson has prepared new plans for the proposed housing schemes, in order to meet the objections raised to the arrangement shown in the model referred to. In order to keep the coalman out of the living room the coal bunker has been removed to the lobby, which has also been enlarged so that the various rooms will enter from it instead of through the living room.

The matter was discussed at a meeting of the Sub-Committee of the Housing Committee.

Mr Paton, the convener, said he thought they should first decide on the question of the principle whether or not they were to recommend the town council to build houses at all, for until that was settled there was no use discussing details If it was decided to go on, then they could discuss the details of schemes. There was only one scheme before them at present, but others had been prepared. There never was any intention to have absolute uniformity in the houses. It was always intended to have elasticity in the designs, to meet the needs and even the prejudices of the tenants. With regard to the rents, these were fixed on post-war conditions, and would be modified according to the changes in the conditions and the assistance the Government gave. They could generally approve of one of the schemes and make application to the Local Government Board for its approval, with the stipulation that the scheme would only be proceeded with on condition that the Government gave not less than 33 1-3 per cent of the cost; that with the view of providing work for men returning from the Army the city engineer be instructed to prepare the necessary plans for streets and sewers, and to make the necessary administrative arrangements, so that the work could be commenced with the least possible delay on the termination of the war; and that the engineer be instructed to negotiate and report as to the situation and price of land suitable for cottages. He pointed out that the Government, in agreeing to give a third of the cost, might stipulate that the town council provided an equal proportion, and that would be two-thirds of the cost.

ALTERNATIVE SCHEMES.

The city engineer said that in order to meet the objections to the model he had prepared four alternative schemes as follows:

(a) Plan showing arrangements similar to the plan first under consideration and as provided in the model, but with coal bunker removed from the kitchen-scullery and placed near the entrance door (in the present lobby), the bed-room enlarged, and a bath provided in each house of whatever size.

(b) Plan showing each house provided with a lobby giving entrance to bedroom and bathroom without passing through the living room, and also showing bath in each house.

(c) A similar arrangement to that provided in (b), with the exception that baths are provided only in three-room houses, and that the smaller houses have a combined sink and tub in kitchen-scullery, instead of sink only as in the model.

(d) Plan similar to (c), with the addition that

certain of the houses are increased in size by the provision of bedrooms in the attic, making the design two storeys and attics, while the former designs were only two storeys in height.

It was finally agreed to approve of the town council building houses, and to hold another meeting to discuss further the details.

SOME RECENT PUBLICATIONS.*

Rivers as Sources of Water Supply. By Alex. Cruikshank Houston, M.B., D.S.C., F.R.S.Ed., Director of Water Examinations, Metropolitan Water Board. Price 5s. nett. London: John Bale, Sons and Danielsson, Limited.

Dr. Houston includes in a small volume a great deal of matter which has hitherto been inaccessible, except by reference to a number of his published reports and lectures. Rainfall results in the Thames Valley, the bacteriological character of the water, the experiments for resistances to filtration, the vitality of the cholera vilvio and the typhoid bacillus, the changes produced by storage, the treatment of algal-affected waters, and the consideration of the typhoid death-rate in London are dealt with in the first three chapters, the contents of which are well known as having appeared in the "Journal of State Medicine" recently. The fourth and concluding chapter deals with sterilisation, the results of the excess lime method, hypochlorite treatment and liquid chlorine treatment being dealt with very fully.

The book is excellently illustrated with curves, diagrams and photographic reproductions. It will be a very valuable book of reference to all those who are concerned with the purification of water, and will be of special use to those who have to consider the possibility of using river waters for drinking water supplies.

The Builder's Foreman. By J. F. Oultram. Price 5s. nett. London: B. T. Batsford, Limited.

In this work the author, who has had an extensive experience as a superintendent of works and builder's manager, writes as a practical man for students and craftsmen in all branches of the building trade who desire to attain higher positions. He shows the aspirant what are the qualifications required for a modern builder's foreman, and lays due stress on the necessity for possessing something more than a practical working knowledge of one or more trades. The book is admirably suited to the needs of those for whom it is intended. Indeed, any man of sound practical experience who masters its pages and acts upon the advice given would make a capable foreman.

The Gasworks Directory and Statistics, 1916-17. Price 10s. 6d. nett. London: Hazell, Watson, and Viney, Limited.

This is the 39th issue of this well-known annual, which may fairly be described as indispensable to all who are practically interested in the gas industry. All the old features have been maintained in spite of the inevitable difficulties of production. The main body of the work is divided into four sections, devoted respectively to England and Wales, Scotland, Ireland, and Foreign and Colonial undertakings. Much useful statistical information is given in summary form with regard to each undertaking, and the editor is to be congratulated on having fully maintained the pre-war standard of accuracy and excellence.

Municipal Pig-Keeping.—Deptford Borough Council [illegible] approved a report of the Works Committee recommending that twenty-four pigs had been purchased and a man appointed as pig-keeper at 40s. per week. Arrangements were in operation for the collection of waste from restaurants, shops and other places in the borough to feed the pigs, and a light cob and van had been purchased for £14 10s. Councillor Soper said that the whole thing was a mistake, because the council had to make up "stench out" at the expense of the ratepayers. He moved that the report be sent back, but there was no seconder.—Alderman Webb asked whether the pigs when fit would be sent to the general market. The mayor replied that that would be dealt with by the Works Committee. It was hoped that in time there would be room for 50 to 100 pigs.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

UTILISATION OF WASTE MATERIALS.

MAKING USE OF EMPTY RAILWAY WAGONS.

In a letter published in our correspondence column on April 6th, Mr. William Charles Clifford Smith, M.Inst.C.E., discussing the suggestion of the President of the Local Government Board that the public should assist in the utilisation of waste materials, drew attention to the lack of means of conveying such materials to the places where they could be utilised. He proceeded to point out that empty wagons are day after day despatched from railway depots to the collieries, and he put forward the suggestion that if some of these wagons could on their journeys carry material that could be made use of in the districts through which they pass, the most important part of the Local Government Board's president's proposition would be decided.

Mr. Clifford Smith's suggestion has apparently not been made in vain, for we understand that he has received from the Ministry of Munitions a letter informing him that an experiment is now being carried out in a selected area very much on the lines set out above.

HOUSING AFTER THE WAR.

GOVERNMENT COMMITTEE TO QUESTION LOCAL AUTHORITIES.

In the House of Commons on Wednesday, Mr. Hayes Fisher said the question of the housing of the working-classes after the war was engaging the careful attention of the Local Government Board. A committee, of which he was chairman, would shortly issue an elaborate series of questions to the various local authorities.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

APPLICATIONS FOR LOANS.

Luton T.C.—£3,660 for electric power mains.

Midsomer Norton U.D.C.—£5,000 for sewage disposal works.

LOAN SANCTIONED.

Workington T.C.—£2,000 for a gas relief main.

Increased Electricity Charges at Shrewsbury.—The Shrewsbury Lighting Committee having reported that the electricity undertaking, after paying interest on loans and sinking charges, showed a deficit for the year of £921, the town council have agreed to increase the charges by 33⅓ per cent instead of 20 per cent.

Waste Paper Collection at Birmingham.—On Wednesday, at a meeting of the Birmingham Lighting, Stables, and Refuse Disposal Committee, it was reported that Sir Roland Bailey, deputy chairman of the Royal Commission on Paper, had visited Birmingham and had examined the scheme in force in the city for the collection of waste paper. He expressed himself as thoroughly satisfied with the method, and he told the committee that he thought the commission would try to get other cities and towns to undertake a similar work on similar lines.

FOR OTHER ADVERTISEMENTS
See End of Paper.

TEMPORARY ENGINEERING ASSISTANT. Required in the office of the Borough Engineer and Surveyor of a County Borough in the Midlands, a Temporary Engineering Assistant, ineligible for military service.

Applicants must be good draughtsmen, with a thorough knowledge of surveying and levelling and had experience in a municipal office.

Salary £5 5s. per week.

Applications, stating age, experience and qualifications, together with three copies of recent testimonials, and stating earliest date on which the applicant could take up his duties if appointed, to Box 1,611, Offices of The Surveyor, 24 Bride-lane, Fleet-street, London, E.C. 4.

June 20, 1917. (3,442)

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Dudley T.C.—A committee is considering the question of the provision of an open-air bath. It has been agreed to erect a tramway shelter in Market-place.

Whitehaven T.C.—The report of a sub-committee has been approved recommending the town council to join in the Derwent joint hospital scheme on the basis of assessable value and population.

HOUSING AND TOWN PLANNING.

Bradbury and Romiley U.D.C.—It was stated that as there would be no new houses built for the next eighteen months the council could provide houses under their town-planning scheme, there being power to obtain land compulsorily if necessary.

Romford R.D.C.—The council have passed a resolution asking the Local Government Board to give powers to local sanitary authorities (and to make the powers compulsory when an ejectment order is obtained) to provide housing accommodation for any families that they desire to have ejected from a cottage on the ground of overcrowding, if such overcrowding be caused by the size or number of one family, and that any charge for rent made for such accommodation shall not exceed 12½ per cent of the earnings going into the house.

MOTOR TRANSPORT.

Abersychan U.D.C.—A committee has been asked to report on the purchase of a motor car for the fire brigade.

Walsall T.C.—As an experiment of the suitability of coal gas for running motor-'buses in the event of petrol being unobtainable at an economic figure, it has been decided to fit one of the municipal motor-'buses with a gas receptacle, at a cost of about £20.

Watford U.D.C.—The fire brigade superintendent has submitted a favourable report with respect to the motor fire appliances, which, he states, give every satisfaction. Promptness in turning out and speed are noted as factors in minimising the damage caused by fires.

REFUSE COLLECTION AND DISPOSAL.

Beckenham U.D.C.—It was reported that the profit derived from the sale of waste paper to May 4th was £200. The money is divided among local hospitals.

Mossley T.C.—A proposal is being considered for the erection of a refuse destructor.

Stockton U.D.C.—The provision of an additional refuse destructor is to be considered by a sub-committee.

Windsor T.C.—It has been agreed to treat at the destructor the refuse collected at Clewer by the Windsor Rural District Council at the rate of 4s. per ton, the rural council to make their own arrangements for the disposal of the refuse when the destructor may be closed down for cleaning or repairs.

Wombwell U.D.C.—The council are considering the provision of a refuse destructor.

ROADS AND MATERIALS.

Abram U.D.C.—The council have decided to accept a tender for the supply of granite setts from the Ceiricg Granite Company.

Antrim C.C.—The county surveyor reports that the work in connection with the six direct labour schemes has proceeded satisfactorily. The council have approved a proposed scheme for the extension of the new road in Ballyminstra, in the district of the Ballymena Rural District Council, at an estimated cost of £600, subject to the Treasury's consent being obtained to a loan.

Arlecdon and Frizington U.D.C.—With a view to expediting the work in connection with the construction of the bridge at Rowrah and the diversion of the road, it has been decided to approach the county council with a view to the employment of the Germans interned in the district.

Deptford B.C.—It was reported by the Works Committee that after consultation with the Commander-in-Chief of the Home Forces and the Commissioner of Police, the Home Secretary had expressed the opinion that where all lamps were now in lighting one in three might be dispensed with from now until August 25th, provided that there was a lighted lamp for each 100 yards of street. The necessary arrangements were being made to carry the proposal into effect.

Fermanagh C.C.—The Local Government Board have written sanctioning the council's direct labour scheme, and also the increased limit of expenditure in the Clones No. 2 rural district.

Greenock T.C.—In connection with the extension of Messrs Laird and Co.'s yard, the town council are considering a proposal to effect an improvement of Main-street, and to widen Hamilton-street.

Flint C.C.—It was reported that the Road Board had raised the amount of the proposed grant of £700 towards the cost of the roads to £1,000, and had also consented to a survey being made of the damage done to the roads at Gwernymynydd-hill and Shotton.

Gosport and Alverstoke U.D.C.—The Roads and Works Committee, in a report, state that as there does not seem a probability of obtaining broken stone for road repairs, it would be advisable to spend the £200 voted for this material in laying artificial paving on the footpath on the north side of Walpole-road.

Littlehampton U.D.C.—In view of the difficulty of obtaining materials for road repairs, the council have agreed to carry out additional tarring, at an estimated cost of £226.

Rugeley U.D.C.—The surveyor, Mr. W. E. Rogers, has been instructed to order material from Tarmac, Limited, for repairing the road from Clewhey's-yard to Sheep Fair, and from the foot of Shut-hill to the boundary of the district.

West Bridgford U.D.C.—Attention having been called to the desirability of tar-spraying owing to the condition of the roads, it was explained that the Government had commandeered the sprayer, but that another was being purchased.

Yarmouth T.C.—Grants to the amount of £368 have been made by the Road Board towards the work of tar dressing certain roads.

SEWERAGE AND SEWAGE DISPOSAL.

Hatfield R.D.C.—The council have referred to the North Mymms Parish Council the plans of a drainage scheme for Welham-green, prepared by the surveyor, Mr. H. T. Sidwell. The estimated cost of the work is £4,000.

Hendon U.D.C.—With reference to certain proposed works of sewerage, involving an estimated expenditure of £4,172, the Local Government Board have written asking the council to include them in the schemes to be executed when the restrictions upon borrowing are withdrawn. The schedule comprises a scheme for the reconstruction of new outfall works north of the river Brent, at an estimated cost of £50,000, a sewage pumping scheme, and the widening of Finchley-road.

Mullingar R.D.C.—Replying to a question in the House of Commons, Mr. Macpherson said no report from the sanitary officer of Mullingar with reference to the danger to the public health from an open sewer running from the military barracks through certain private grounds appeared to have reached the military authorities. No action was contemplated, as the local officers report that the whole sewerage system, which was not an open sewer, but a properly-designed pipe-line, was in perfect order.

St. Columb R.D.C.—It has been agreed to instruct an engineer to prepare the plans of a sewerage scheme for Crantock in order that a loan may be obtained at the earliest possible moment after the war.

Truro T.C.—The city council have referred to the Sanitary Committee a communication from the Local Government Board suggesting that the amended plans

of the proposed sewage disposal scheme, involving an estimated expenditure of £24,300, should be submitted as soon as possible in order to avoid delay when the present restrictions on the construction of works and the borrowing of money were withdrawn.

WATER, GAS, AND ELECTRICITY.

Battersea B.C.—The Electricity Committee recommend electric main extensions, at an estimated cost of £1,441.

Dundee T.C.—It was reported that the Water Commissioners' accounts for the past year had been closed with a surplus of £2,157. The sum of £1,482 had been spent on the cultivation of land for food-production, and this amount be charged not against capital but against revenue. The capital debt had been reduced by £21,321, this being the largest reduction made on the debt in any year. The unliquidated capital indebtedness now stands at £790,781.

Golborne U.D.C.—The surveyor, Mr. H. Eckersley, reported that at a point 50 yds. from the waterworks the 8-in. main, which was cleaned in 1911, was found to have an incrustation of ½ in., while at a point 50 yds. from the Lowton-road end there was an incrustation of 1¼ in. which meant that the main was reduced to 7 in. and 5½ in. respectively at these points, or an average of 6¼ in. The council have asked the Adamson Water Main Cleaning Company to submit a price for cleaning the main, and it has also been resolved to ask the Ince-in-Makerfield Urban District Council to allow a supply of water to pass through the by-pass for the ensuing four or five months.

Liverpool T.C.—The water engineer, Mr. Joseph Parry, reported on Tuesday to the Water Committee that the effects of the frost of last January and February are still felt in the increased waste taking place from lead pipes and fittings, chiefly from underground lead pipes, the escapes from which are not visible at the surface. Clear evidence of this waste is afforded by the high quantities drawn from the distributing mains during the hours of the night. The discovery and repair of such leakages is at present exceptionally difficult owing to the shortage of inspectors and plumbers. The increased consumption this year has been nearly 9 per cent, whereas during the same period of the previous year it was 1·8 per cent. The committee will consider the suggestions contained in the report, including one with respect to the laying of new mains.

Margam U.D.C.—In answer to an application from Aberavon Town Council, the clerk has been directed to write that the council contemplates constructing a large storage reservoir as soon as possible after the war, and are open to negotiate with the town council for the supply of water to Aberavon.

Newport (Mon.) T.C.—A proposal has been adopted to effect extensions of the east electricity power station and plant, at an estimated cost of £7,482.

Paisley T.C.—The burgh water supply is now considered to be in a highly satisfactory position. There is a total storage capacity equivalent to over seven months' supply and at present there is 194 days' supply in the reservoirs.

Penzance T.C.—With a view to increasing the water supply, it has been agreed to construct a 15-in. borehole to a depth of 300 ft. below the existing sump at Polteggan, at an estimated cost of £1,250. It is calculated that this will allow a consumption of 40 gallons per head daily.

Rhyl U.D.C.—It was stated that while the council had anticipated a profit from both the gas and water concerns the former had not come up to expectations, but the latter had made twice the profit expected, about £1,000. It was hoped to wipe off the municipal debt this year by the extra supplies of water and electricity to the War Department.

Whitehaven R.D.C.—With a view to the acceleration of the water supply, it has been agreed to join the Harrington Urban District Council in the purchase of a new pumping engine at Stainburn at an estimated cost of £300.

MISCELLANEOUS.

Greenwich B.C.—The Highways Committee reported as to the carriage and storage of wood and cotton waste, the collection of which has been undertaken by a committee of ladies acting under the mayoress. The committee stated that having regard to the fact that such material would be very inflammable, they must reluctantly decline to offer accommodation for storage. Arrangements had been made for cartage.

Holme Cultram U.D.C.—A committee has been appointed to consider certain proposed repairs to the sea wall.

Littlehampton U.D.C.—A report of the surveyor, Mr. R. Booker, giving details of pig-sties in use at Epsom was considered, and the further consideration of the scheme was ordered by the Highways Committee to be deferred. Mr. Denyer said that the increase in the cost of materials for building the sties, and the very high price of foodstuffs, made the scheme inopportune. The committee felt, however, that at some future time the council would be well advised to proceed with the scheme.

Penzance T.C.—The town council have approved the scheme of the deputy surveyor for the construction of two buttresses for the protection of the sea wall at Sandy Bank, at an estimated cost of £160.

PERSONAL.

Mr. Domican and Mr. Hurley, assistant surveyors to the Kildare County Council, have had their salaries increased by £20 a year.

Mr. D. Waterhouse, engineer and surveyor to the Watford Urban District Council, has been voted £500 for work done in connection with the water supply scheme.

Mr. M. Martin has been appointed senior assistant county surveyor of Galway during the absence of Mr. George Lee on road service in France, at a salary of £200, with £100 for travelling expenses.

Mr. W. Stonebridge, who was special drainage engineer of Secunderabad for one year, has had his period of service extended for a further term of three years as sanitary engineer, Secunderabad.

Mr. W. N. Hampton, surveyor and inspector to the Leake, Notts, Rural District Council, having been granted final exemption, to expire in about a month, has tendered his resignation, and steps are being taken to obtain a successor.

Mr. W. Gunnell Wood, who has retired from the office of chief engineer of the buildings and roads branch of the Public Works Department, United Provinces, India, has been appointed principal of the Thomason College of Engineering, Roorkhee.

Mr. T. E. Thomas has been selected as development superintendent in the traffic branch of the London County Council Tramways at a salary of £800 a year. He is at present commercial superintendent of the District Railway and the London General Omnibus Company.

Seventy-six applications have been received for the position of surveyor to the Sheerness Urban District Council.

The question of appointing a successor to the late Mr. Wm. Harpur, the city engineer of Cardiff, is being dealt with by the Public Works Committee of the corporation, plus the chairmen of the other committees concerned.

KILLED IN ACTION.

Lieutenant J. H. Westlake, a pupil in the Taunton borough surveyor's department, has been killed in action.

Local Authorities and Coal Distribution.—Ealing Town Council have agreed to purchase 1,000 tons of coal for sale to the inhabitants during the winter.

Royal Sanitary Institute.—At a meeting of this body, to be held at Chatham Town Hall on Saturday, September 29th, a paper, entitled "Some Aspects of the Housing Problem," will be read by Dr. J. Holroyde, medical officer of health, and one entitled, "Street-Cleansing Methods," by Mr. R. L. Honey, assistant borough surveyor of Chatham.

Kerb Signs.—Hammersmith Borough Council, having received a proposal of the London General Omnibus Company to erect signs on the kerbs in the Broadway, opposite the District Railway Station, showing where each omnibus stops, and its destination, with a view to passengers being lined up in queues, have informed the omnibus company that they see no objection to the proposal.

SAND-CLAY ROADS IN THE UNITED STATES.*

By CHARLES H. MOOREFIELD.

A road surface constructed of sand and clay mixed in proper proportions possesses the resisting powers of the sand in wet seasons and of the clay in dry seasons, and frequently is superior to either in all seasons.

Natural sand-clay soils occur to some extent in nearly all sections of the United States, and in many localities are rather widely distributed. Ordinary earth roads frequently contain short sections which are constructed of such soil, and it happens occasionally that for a considerable distance along a road the soil contains just the proper proportions of sand and clay to produce an excellent road surface for moderate traffic under all weather conditions to which the road is subjected. But, in general, such soils occur only for limited distances, and to secure a continuous surface of this kind the necessary material must be hauled to the road, spread, and compacted after the grading is completed otherwise. More generally, perhaps, the soil composing the roadbed is deficient in only one of the necessary constituents, sand or clay, and it frequently may be economical to construct the surface by supplying the necessary sand or clay and mixing it with the natural soil of the roadbed, rather than to provide a surface of natural sand-clay material. It may happen also that the roadbed contains no material suitable for use in constructing the surface, and that sand and clay are more readily available separately than readily mixed. In such case both materials may be hauled to the road and mixed in place to form the surface.

In order to distinguish between common earth roads, which are constructed wholly of the natural soil as it occurs along the road, and those which have been surfaced with especially selected or especially prepared earth which contains sand and clay mixed in such proportions as to increase the resistance to wear of the surface as described above, the latter are designated sand-clay roads. This designation evidently includes most of the so-called "topsoil" roads, because topsoil which is especially suited for use in road surfaces generally possesses that quality by virtue of the sand and clay which it contains

The sand-clay method of construction has produced its best results in the Southern States, where deep freezing is not a serious factor and where materials suitable for such construction probably are more widely distributed than in any other section of the country. There are many sand-clay roads in the South Atlantic and Gulf States over which heavy loads of cotton and other farm products are hauled throughout the year and which remain continuously in good condition with a comparatively very small outlay for maintenance. And there are innumerable cases where sand-clay surfaces, constructed of even rather inferior materials, have so improved intolerable stretches of sandy or muddy road as to provide for at least fairly comfortable travel throughout the year. Examples of the latter kind are by no means peculiar to the Southern States, but are to be found in nearly every section of the country.

According to recent statistics gathered by the Office of Public Roads and Rural Engineering, the aggregate length of all public roads in the United States is, roughly, two and one-half millions of miles. Of this total mileage, earth roads comprise about 89½ per cent, or considerably more than 2,200,000 miles; sand-clay nearly 2 per cent, or 44,000 miles; and gravel about 4½ per cent, or 116,000 miles, which leaves only about 4 per cent, or about 110,000 miles, for all other types combined. The statistics also show that in the 10 years from 1904 to 1914 the increase in the mileage of improved roads, other than earth, sand-clay, and gravel, has been only from 2 to 3 per cent of the total, and that in States having the greatest mileage of improved roads, only about one-half of their aggregate mileage has yet been improved.

The Price of Horses.—Camberwell Borough Council purchased recently seven horses, all of which have now been passed by the veterinary surgeon. The lowest price paid for an animal was £94, and for the others the prices ranged from £102 to £107.

* Extract from Bulletin No 463, United States Offices of Roads and Rural Engineering.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

ANNUAL MEETING PROGRAMME.

The forty-fourth annual general meeting of the Institution of Municipal and County Engineers will be held at the Town Hall, Hastings, on Thursday, Friday, and Saturday, the 28th, 29th, and 30th inst.

Thursday, June 28th.

At the Town Hall, Hastings:—

9.30 a.m.—Meeting of subscribers to the Orphan Fund in Council Chamber.

10.0 a.m.—Council meeting in committee in Room A.

10.30 a.m.—Annual general meeting.

Attendance at the annual general meeting will be restricted to members of the institution, who should assemble in the council chamber.

Chairman: The outgoing President Mr. J. S. BRODIE, M.INST.C.E.

Minutes of the last annual general meeting.

Annual report of the council (to be taken as read).

Presentation of premium.

Election of auditors and scrutineers.

11.30 a.m.—Visitors and delegates will be admitted.

12.0 a.m.—Welcome by the Right Worshipful the Mayor of Hastings (Mr. Alderman George Hutchings, J.P.), and installation of Mr. P. H. Palmer, M.INST.C.E., as president.

Chairman: Mr. P. H. PALMER, M.INST.C.E. (President).

PRESIDENTIAL ADDRESS.

1.0. p.m.—Adjournment for lunch.

CONFERENCE.

2.30 p.m.—Discussion on the following papers (to be taken as read):—

1.—"Public Abattoirs," by H. A. Brown, engineer and surveyor to the urban district council, Weston-super-Mare.

2.—"Extraordinary Traffic and Excessive Weights on Highways," by H. T. Wakelam, M.INST.C.E., county engineer, Middlesex

4.30 p.m.—Council meeting (for election of committees) in Committee Room A.

Friday, June 29th.

At the Albany Hotel, Hastings:—

10.30 a.m.—Discussion on the following papers (to be taken as read):—

3.—"Examinations," by E. Willis, A.M.INST.C.E., engineer to the urban district council, Chiswick.

4.—"Dry Rot," by E. J. Goodacre, A.M.INST.C.E., assistant borough surveyor, Shrewsbury.

1 p.m.—Lunch at the Town Hall, by invitation of the Right Worshipful the Mayor of Hastings (Mr. Alderman George Hutchings, J.P.).

2.30 p.m.—Visit to Brede Valley Waterworks of the Hastings Corporation. Tickets, 4s 6d. each.

8.0 p.m.—Smoking concert at the Albany Hotel (by kind invitation of the president, Mr. P. H. Palmer). Ladies cordially invited.

The public works of Hastings will be open to inspection by members throughout the meeting on presentation of their meeting tickets.

Saturday, June 30th.

10.0 a.m.—Assemble at the Albany Hotel, where conveyances will be in readiness to visit Battle Abbey (by kind permission of Sir A. Webster, Bart.). Tickets, 4s. 6d. each.

The return to Hastings will be made in time for lunch.

ORPHAN FUND MEETING.

A general meeting of the subscribers to the Orphan Fund of the Institution will be held at 9.30 a.m., on Thursday, June 28th, at the Town Hall, Hastings, to consider the following business, viz.:—

1. To read and confirm minutes of the annual general meeting held at the Town Hall, Blackpool, on Thursday, June 29, 1916.

2. To receive the annual report of the General Committee, together with balance-sheet for the year ended December 31, 1916.

3. To receive result of ballot for election of members to fill vacancies on the committee for the ensuing year.

4. To elect honorary secretary.

5. To elect honorary treasurer.

6. Any other business.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

ANNUAL SUMMER CONFERENCE.

The annual summer conference of the Association of Managers of Sewage Disposal Works will be held at Worcester on Saturday, July 7th.

PROGRAMME

11 a.m.—Assemble at the Guildhall.

Dr. Sidney Barwise, B.Sc., will deliver his presidential address.

Mr. Thos. Caink, ASSOC.M.INST.C.E., city engineer, will read a paper on "The Activated Sludge Process of Sewage Purification."

2 p.m.—Visit to the Worcester Sewage works to inspect the activated sludge installation in operation.

INSTITUTION OF WATER ENGINEERS.

SUMMER MEETING.

The annual summer meeting of the Institution of Water Engineers will be held in London to-day (Friday), commencing at 2.15 p.m.

A paper entitled "Colour Records Applied to Potable Waters" will be presented by Mr. J. S. Pickering, M.INST.C.E., of Cheltenham (past president), and a discussion on "Water Supplies as Sources of Power" will be introduced by Mr. Cecil H. Roberts, M.INST.C.E., of Aberdeen (member of the council). The premiums awarded by the council for papers read during the year 1916 will be presented to the respective authors, and the president will read a short report on the past year's working.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SEWAGE WORKS ENGINEER.—June 25th.—Barnet Urban District Council.—Mr W. Plumpton, acting surveyor, Council Offices, Wood-street, Barnet.

INSPECTOR OF NUISANCES.—June 25th.—Leake Rural District Council. £65 per annum.—Mr. A. W. Jarratt, clerk, Union Offices, Loughborough.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 26th.—Ware Urban District Council.—Mr. Geo. H. Gisby, clerk, Council Offices, Ware, Herts.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 27th.—Burgess Hill Urban District Council. £250 a year.—Mr. A. F. Hardwick, clerk, Council Offices, Burgess Hill, Sussex.

SEWAGE WORKS SUPERINTENDENT.—June 28th.—Woking Urban District Council. £120, with house, fuel and light.—Mr. O. Claude Robson, engineer, Municipal Offices, Dyne-road, Kilburn, N.W. 6.

ASSISTANT SEWAGE WORKS ENGINEER.—June 28th.—Woking Urban District Council.—Mr. G. J. Wooldridge, surveyor, Council Offices, Woking.

SEWAGE WORKS ENGINEER.—June 29th.—Woking Urban District Council.—Mr. G. J. Wooldridge, surveyor, Council Offices, Woking.

HEALTH VISITORS.—June 30th.—Basford Rural District Council. £100 per annum, with an allowance of £5 for uniform.—Mr. Henry Stone, clerk, Public Offices, Basford, Nottingham.

TEMPORARY INSPECTOR OF NUISANCES.—June 30th.—Basford Rural District Council.—Mr. Henry Stone, clerk, Public Offices, Basford, Nottingham.

SURVEYOR'S TEMPORARY ASSISTANT.—July 2nd.—Chesham Urban District Council.—Mr. Percy C. Dowse, engineer and surveyor, Council Offices, Chesham, Bucks.

SURVEYOR AND INSPECTOR OF NUISANCES.—July 7th.—Chipping Ongar Rural District Council. £220 a year.—Mr. F. Evans, clerk, Council Offices, Bank Buildings, Ongar.

ASSISTANT ENGINEER.—Maidenhead Corporation. Urban District Council.—The Surveyor, Council Offices, Town Hall, Maidenhead.

DRAUGHTSMAN.—Ordnance Survey Department, Southampton.—£90 per annum.—Crown Agents for the Colonies, 4 Millbank, London, S.W.1.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

WIGAN.—June 19th.—For converting stables into a motor tower wagon garage, for the corporation.—Mr. A. T. Gooseman, borough engineer, King-street West, Wigan.

OAKWORTH.—June 20th.—For pulling down and rebuilding a boundary wall, for the urban district council.—The Surveyor, Council Offices, Oakworth, Yorks.

GREENOCK.—June 25th.—For alterations and additions at Togo House, Dempster-street, for the corporation.—The Master of Works, Municipal Buildings, Greenock.

SALFORD.—June 25th.—For the supply and erection of steam boiler housing comprised of steel framework and corrugated sheeting, for the corporation.—Borough Electrical Engineer, Frederick-road, Salford.

GLASGOW.—June 25th.—For the erection of a janitor's house at an industrial school, for the School Board.—Property Department, School Board Offices, 129 Bath-street, Glasgow.

CHESHUNT.—June 26th.—For the erection of a small-pox hospital, comprising ward block, administration block, and laundry and mortuary block, for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor, Manor House, Cheshunt.

HUDDERSFIELD.—June 28th.—For the erection of twenty-two dwelling-houses, and the construction of a new street, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor, 1 Peel-street, Huddersfield.

HULL.—June 29th.—For the builders' and ferro-concrete work in connection with the foundations and pond for water cooling towers, for the corporation.—City Engineer, Town Hall, Hull.

WILTS.—June 30th.—For alteration and repairs at schools, for the county council.—Mr. J. G. Powell, county surveyor, Trowbridge.

GRIMSBY.—June 30th.—For extensions to the isolation hospital, for the rural district council.—The Engineer and Surveyor, Rural Council Offices, Grimsby.

Engineering: Iron and Steel.

GALWAY.—June 25th.—For the completion of a dug-out well, for the rural district council.—Mr. E. O'Malley, Mounterowen, Maam.

PORTSMOUTH.—June 25th.—For the construction of a concrete seat 350ft. long on the Southsea esplanade, for the corporation.—Borough Engineer, Town Hall, Portsmouth.

TOTTENHAM.—June 26th.—For re-setting a Lancashire boiler at the sewage works, for the Tottenham and Wood-green Joint Drainage Committee.—Major W. H. Prescot, R.E., engineer, Town Hall, Tottenham.

EGREMONT.—June 29th.—For the supply of one exhauster (capacity 10,000 cubic feet per hour), for the urban district council.—Manager, The Gasworks, Egremont, Cumberland.

NEWPORT (Mon.).—June 30th.—For the supply of induced draught plant, additions and extensions to fuel economisers, and cooling towers, for the corporation.—Mr. A. N. Moore, borough electrical and tramways engineer, Town Hall.

WOLVERHAMPTON.—June 30th.—For the supply of water cooling towers and motor-driven pumps, for the corporation.—Mr. S. T. Allen, engineer and general manager, Electricity Works, Commercial-road, Wolverhampton.

WARRINGTON.—July 4th.—For the supply of a motor tower wagon, for the Electricity and Tramways Committee.—Mr. F. V. L. Mathias, borough electrical and tramways engineer, Howley, Warrington.

GLASGOW.—For the supply of boiler-house plant and extra high tension switchgear, for the electricity department.—Mr. W. W. Lackie, engineer, 75 Waterloo-street, Glasgow.

Roads.

NORTH WALSHAM.—June 22nd.—For the supply of broken granite and broken flints, for steam rolling, for the urban district council.—Mr. J. W. Stevens, surveyor, North Walsham, Norfolk.

KING'S LYNN.—June 25th.—For the supply of road material, for the corporation.—Mr. Raymond A. Newstead, acting borough surveyor, Town Hall, King's-Lynn.

LEPTON.—June 26th.—For the reconstruction of a portion of Wakefield-road, for the Urban District Council.—Messrs. J. Berry and Sons, surveyor, 3, Market-place, Huddersfield.

CANNOCK.—June 29th.—For the reconstruction of the main road between Cannock and Hednesford, and other works in connection therewith, for the urban district council.—Mr. R. Blanchard, engineer and surveyor, Council Offices, Cannock.

Sanitary.

KEMPSTON.—June 25th.—For the construction of a storm-water relief sewer, about 350 yards 9-in. pipe, together with two silencers, for the urban district council.—The Surveyor, Council Offices, Bedford-road, Kempston, Beds.

STEYNING WEST.—June 25th.—For the removal of house refuse and cleaning ashpits, for the rural district council.—Mr. F. Slaughter, engineer and inspector, High-street, Steyning.

WREXHAM.—July 4th.—For the removal of house refuse, for the rural district council.—Mr. G. V. Price, interim clerk, Council Offices, Midland Chambers, Wrexham.

AMLWCH.—For the supply of galvanised sanitary pans, 16 in. diameter by 16 in. deep, for the urban district council.—Mr. W. Fanning, clerk, Council Offices, Amlwch, Anglesev.

Stores.

GREENOCK.—June 25th.—For the supply of coal, cement, lime, fireclay pipes, pavement, whinstone setts, road metal, and cartage, for the corporation.—Master of Works, Municipal Buildings, Greenock.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* **Accepted.** † **Recommended for acceptance.**

TEDDINGTON.—Accepted for the supply of materials for the urban district council:—
Flints.—Wills & Packham, Sittingbourne.
Tar Paving.—Constable, Hart & Co., Limited, 41 Eastcheap, E.C. 3.
Portland Cement.—Eastwood & Co., Limited, Belvedere-road, Lambeth, S.W. 1.
Ferric Sulphate.—F. W. Berk & Co., Limited, 1 Fenchurch-avenue, E.C., 3.
Tools.—F. Bird & Co., Horton-road, West Drayton.
Pipes, &c.—John Knowles & Co., 38 King's-road, St. Pancras, N.W. 1.
The committee did not recommend the acceptance of a tender for the supply of granite owing to the uncertainty of delivery from the Channel Islands, but the surveyor (Mr. M. Hainsworth) was instructed to purchase in the best market the small quantity that would be required this half-year.

TILBURY.—Accepted.—For tar-spraying military and other roads, and supplying 10,000 gallons of refined tar, and works incidental thereto, for the urban district council.—Mr. S. A. Hill-Willis, engineer and surveyor, Council Offices, Tilbury:—
T. Crow & Sons, West Ham, refined tar, 3½d. per gallon.
L. Summerfield, Limited, Kennington Park-road, S.E., tarviated granite, 33s. per cub. yd.
G. Eagleton, Aylesford, 2-in. tarred rag, 24s. per cub. yd.
W. H. Bensted & Sons, Maidstone, ½-in. tarred rag, 25s. 6d. per cub. yd
James Wall, screened gravel, 8s. per cub. yd.
James Wilton, heavy shire-bred horse, £100.
Barrows & Co., Banbury, street water cart, £30.
W. & C. French, Buckhurst Hill, Essex, laying 600 ft. 15-in. pipes, £407; laying Croft artificial flagging, 6s. 6d. per super. yd.
H. V. Smith & Co., 20 Victoria-street, Westminster, spraying only 1 gallon to 5 yds., 1½d. per super. yd.; spraying only 1 gallon to 8 yds., 1d. per super. yd.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

22.—Institution of Water Engineers: Summer Meeting in London.
28-30.—Institution of Municipal and County Engineers: Annual Meeting at Hastings.
29.—Tramways and Light Railways Association: Annual Congress. Institution of Civil Engineers, Great George-street, Westminster. 2.30 p.m.

JULY.

7.—Association of Managers of Sewage Disposal Works: Annual Summer Conference at Worcester.
10.—Institute of Cleansing Superintendents: Annual conference at Nottingham.

APPOINTMENTS OPEN.

RURAL DISTRICT COUNCIL OF BASFORD.

The above Council invite applications for the appointment of Temporary Inspector of Nuisances for the whole of their district, from persons ineligible for service with His Majesty's Forces, to fill vacancy caused by inspector's absence on military service.

The person appointed must hold the certificate of the Royal Sanitary Institute, and be a certified inspector of meat.

The district has an area of about 65,000 acres, and an estimated population of 42,000. A bicycle will be provided and such travelling expenses allowed as may be certified by the medical officer of health.

Applications, in candidate's own handwriting, stating age, qualifications, weekly salary required, date when duties can be commenced, with copies of three recent testimonials, to be sent to the undersigned, not later than Saturday, the 30th instant.—(By order),

HENRY STONE.
Clerk.

Public Offices,
Basford, Nottingham.
8th June, 1917. (3,428)

RURAL DISTRICT COUNCIL OF BASFORD.
APPOINTMENT OF TWO HEALTH VISITORS.

The above Council invite applications for the appointment of Health Visitors, for the two divisions of their district. No. 1 Division: Area, 36,000 acres; estimated population, 21,500. No. 2 Division: Area, 30,000 acres; estimated population, 20,500.

Each applicant must be a trained hospital nurse, hold the inspectors' certificate of the Royal Sanitary Institute, and a certificate in midwifery, and have experience as a health visitor. No others need apply.

The salary of each officer will be after the rate of £100 per annum, increasing by £5 a year, on approved service, to a maximum of £120, with an allowance of £5 per annum for uniform. A bicycle will be provided, and such reasonable travelling expenses allowed as are certified by the medical officer of health.

Applications, in candidate's own handwriting, stating age and qualifications, together with copies of three recent testimonals, to be sent to me not later than Saturday, the 30th instant.—By order,

HENRY STONE,
Clerk.

Public Offices,
Basford, Nottingham.
8th June, 1917. (3,429)

WILLESDEN DISTRICT COUNCIL.

The above Council invites applications for the post of Resident Superintendent at their Sewage Works, who shall also act as Clerk-in-Charge of Depot at Stonebridge.

The applicant must be well versed in duties of a similar character, and exempted from military service. He shall also devote the whole of his time to the services of the Council.

The salary will be £120 per annum, together with house, fuel, and light.

Applications, stating age and nature of exemption from military service, accompanied by copies only of three testimonials, to be delivered to the undersigned not later than Thursday, June 28th, 1917.

O. CLAUDE ROBSON,
Engineer to the Council.

Municipal Offices,
Dyne-road, Kilburn, N.W. 6.
June 13th, 1917. (3,434)

CHESHAM URBAN DISTRICT COUNCIL.

The above Council require the services of a Temporary Assistant in the Surveyor's Office. Applicants must be good draughtsmen, capable of levelling and surveying, and ineligible for military service.

Applications, stating experience, age, and salary required, to be sent to the undersigned on or before Monday, July 2nd, 1917.

PERCY C. DORMER,
Engineer and Surveyor.

Council Offices,
Chesham,
Bucks. (3,440)

CHEPSTOW URBAN DISTRICT COUNCIL.

APPOINTMENT OF SURVEYOR AND INSPECTOR OF NUISANCES.

The above Council require the services of a competent Surveyor and Inspector of Nuisances, at a salary of £200 per annum, rising in three years to £250.

Applicants must be ineligible for military service.

Candidates must be experienced in surveying, preparation of plans and estimates, road-making, drainage, sewage treatment and sanitary matters, and be able to satisfy the requirements of the Local Government Board as an Inspector of Nuisances (the appointment of Inspector being subject to the approval of such Board).

The Inspector's duties will include those under the Public Health Acts, the Orders of the Local Government Board, the By-laws of the Council, the Dairies, Cowsheds and Milkshops Orders, Factory and Workshops Act, 1891, the Housing and Town Planning Act, the duties of Inspector of Petroleum, and Inspector of Port Sanitary Authorities, &c.

The successful candidate will be required to devote his whole time to the service of the Council, to give satisfactory security in the sum of £300, and to reside within the district.

Canvassing, either directly or indirectly, will disqualify.

Selected candidates will have notice to attend on the day of election, and will be allowed third class railway fare.

Applications, endorsed "Surveyor and Inspector," stating age, experience and qualifications, with copies of not more than three recent testimonials, must be sent to me, the undersigned, not later than the 7th July, 1917.

F. EVANS,
Clerk to the Council.

Council Offices,
Bank Buildings,
Chepstow.
12th June, 1917. (3,439)

TENDERS WANTED.

BOROUGH OF KING'S LYNN.

The Corporation invite Tenders for the Supply of Road Material for the year ending 31st March, 1918.

Full particulars may be obtained on application to the undersigned, to whom sealed Tenders, on Forms and in envelopes supplied, must be delivered, accompanied by Samples, not later than 10 a.m. Monday, June 25th, 1917.

The Corporation does not bind itself to accept the lowest or any Tender.

RAYMOND A. NEWSTEAD,
Acting Borough Surveyor.

Town Hall, King's Lynn,
8th June, 1917. (3,430)

APPOINTMENTS WANTED.

CIVIL ENGINEER AND SURVEYOR, A.M.I.C.E. (ineligible), desires employment during war. Large experience Sanitation, Water Supply and General Construction.—Box 1,608, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. 4. (3,424)

BRIDGES, BUILDINGS, DRAINAGE SYSTEMS.—A civil engineer, with 14 years' practical experience on works, desires Engagement as Resident Engineer, or with contractor on works of national importance. Excellent references.—Apply, giving full particulars, Box 1,610, Offices of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. 4. (3,441)

MISCELLANEOUS.

FOR SALE - Vols. XXV. to L., both inclusive, of THE SURVEYOR for Sale What offers? Also excellent Dumpy Level, by Elliott Bros., Strand, with tripod and staff, complete.—Apply, Surveyor, Town Hall, Ware. (3,432)

THE VICTORIA CONCRETE MIXER

illustrated above is a No. 0 (Batch 6 cubic feet) on truck, with petrol engine, water tank and side loader. We supply many other sizes and styles suited to all classes of concrete and ferro-concrete work.

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MR. PHILIP H. PALMER, M.INST.C.E.,

Borough Engineer of Hastings.

President of the Institution of Municipal and County Engineers, 1917-18.

The Surveyor

And Municipal and County Engineer.

Vol. LI. JUNE 29, 1917. No. 1,328.

Minutes of Proceedings.

Extraordinary Traffic.

In the paper on "Extraordinary Traffic and Excessive Weight on Highways," presented at the annual meeting of the Institution of Municipal and County Engineers this week, Mr. Wakelam succeeded in infusing a new interest into one of the most difficult subjects with which municipal engineers have to deal. The merit of the paper lay not so much perhaps in the lucid exposition of bare legal principles as in their application to such living questions as motor omnibus traffic and railless traction. The former matter was introduced by a reference to the recent Abingdon case, which has already been fully noted in these columns. The decision in that case forms a landmark in the history of extraordinary traffic litigation, as it is the first case in which the cost of repairing damage done by motor omnibuses has been recovered on the ground that such traffic is "extraordinary." Moreover, it is bound to go some way towards the establishment of the principle of contribution—a principle which Parliament has shown an increasing disposition to accept. The first Act, we believe, which provided for a direct contribution from motor omnibus traffic towards the maintenance of roads was the County of Middlesex Great West Road Act, which empowered the county council to make a charge of three-eighths of a penny per car-mile on such traffic. Subsequently the appointment of a committee was sanctioned by Parliament to inquire into the question of the amount (if any) which the owners of motor omnibuses should contribute towards the upkeep of the roads which they traverse; but, unfortunately, the advent of war has prevented any progress being made with the inquiry. As an emergency measure, however, a clause was inserted in the Local Government (Emergency Provisions) Act of last year—a clause which has already been fully discussed in these columns. It will be remembered that the clause precludes the establishment of new motor omnibus routes without the consent of the highway authority, and provides that such consent may be granted on terms. Further, if consent is refused, or terms cannot be agreed upon, an appeal lies to the Local Government Board. In this connection it is very important to remember, as Mr. Wakelam pointed out, that even if such an appeal is upheld and a new route is established against the will of the highway authority, the mere consent of the Local Government Board would not prevent a claim for damage by extraordinary traffic if such damage in fact takes place. This fact places a powerful argument at the disposal of surveyors in conducting negotiations with regard to proposed new routes. The principle of contribution has also been recognised by Parliament in connection with a number of schemes for railless trolley vehicles. Again, however, it may be suggested that, apart from any statutory obligation to contribute, highway authorities might fairly claim that traffic of this kind is *per se* "extraordinary," and that the promoters should pay a fair contribution towards the upkeep of the roads they use.

Mr. Wakelam also had a good deal to say as to the function of the surveyor in connection with an extraordinary traffic claim of the usual kind. The whole foundation of the proceedings is the certificate of the surveyor under sec. 23 of the Highways and Locomotives (Amendment) Act. Many claims have failed owing to some technical defect in this certificate, and we quite agree that in any case in which proceedings are likely to ensue the responsibility for drafting it should fall upon the legal advisers of the highway authority, and not upon their engineer. The only legitimate function of the engineer in these cases is to call the attention of his authority to any damage caused by traffic which cannot be considered to come within the category of the ordinary traffic of the district, and to furnish returns of such traffic, and full details of expenses. Further, he must be prepared to prove strictly in a court of law every fact which he alleges. Indeed, success will often depend upon the care which has been taken in getting up the case in its preliminary stages, and the ability to marshal the available evidence in a lucid and orderly way.

* * *

Road Improvement in Canada.

Road construction in Canada is a problem of supreme economic importance, and it is gratifying to find that it is being handled in a progressive spirit alike by the central and the local authorities of the Old Dominion. With the development of the agricultural and mineral resources of the country, it is in accordance with the fitness of things that there should have arisen a demand for arterial roads of an improved order, and in the Western and Eastern provinces this demand is being promptly and efficaciously converted into practice. There is something, if not of romance, at least of novelty and enterprise, in the methods resorted to for carrying out the schemes of road construction in these pioneer settlements on the fringe of civilisation; but the whole story of Canada is overflowing with the element of the romantic that we need not wonder at the importation of new ideas into the ordinary prosaic methods of road engineering

The Provincial Governments of Manitoba and Saskatchewan, recognising that the road question is an Imperial as well as a local consideration, are sending out skilled officials to instruct rural communities in the methods of road making suitable to the country. But, improving upon this educative process, the Manitoba Department of Public Works inaugurated last year what is termed a new system for the encouragement of road building, under which a grant of money is made for each mile of road which is maintained in a condition satisfactory to the Government inspectors. This is, of course, in some respects analogous to our own system of county direction and supervision of urban roads, and the result proved so satisfactory that this year the grant per mile was increased by 50 per cent. The number of authorities which are placing their main roads under systematic and expert organisation has greatly increased. Saskatchewan, going one better than Manitoba, has arranged a competition among local bodies, and prizes are awarded to those adjudged to have succeeded best in road maintenance. This competitive encouragement has infected a public-spirited firm of Moose Jaw with an inspiration to institute a scheme for the improvement of roads in that locality. They decided to set aside approximately a thousand dollars in prizes, and, with the countenance of the highways department of Regina, the competition is to take place as from June 1st to September 30th. All roads entered in the competition must be at least 3 miles in length. During the season the roads will be judged according to the condition of the grade, hardness of surface, and smoothness, also the condition of the ditches, freedom from weeds, amount of traffic, and general appearance and usefulness. The awards will be made by the same judges who are appointed by the Saskatchewan Highways Department in connection with the department's road maintenance competitions. The thing has an air of the primitive as well as the novel about it, but it is well to remember that in Canada, as indeed in all new communities, the primitive is but a stage on the onward march of progress. Such a competition is not so much an end in itself as the means to an end.

* * *

The Presidential Address.

The address which was delivered by Mr. Palmer on the occasion of his inauguration as president of the Institution of Municipal and County Engineers was of the usual high standard. Not only did he pass under review many matters of engineering practice which are of special interest at the present time, but he also dealt at some length with questions of what we may call "domestic politics." It is perhaps not always remembered that the object of the institution is not merely to afford opportunities for the discussion of papers on subjects of mutual interest, but also to watch over the general interests of the municipal engineering profession. The questions of status, security of tenure and superannuation are therefore well within the legitimate sphere of the activities of the institution, and Mr. Palmer did well to show at the outset of his term of office that he is fully alive to their importance. In this connection he expressed the opinion that the institution will never get that full recognition from Parliament and the Local Government Board which it deserves until it can show that it represents the whole body of municipal engineers and surveyors throughout the United Kingdom. In other words, the existence of two institutions—each of which we readily recognise is doing excellent work—is in itself necessarily a source of weakness. We have long held the opinion that if there were any real desire for the union of the two institutions, it ought not to be impossible with mutual goodwill to devise a satisfactory scheme of amalgamation. Mr. Palmer thinks that the time is ripe for action in this direction, and that the obstacles and difficulties to be overcome are not really so formidable as may at first sight appear. Is it too much to hope that his year of office may be marked at least by a real attempt at fusion, if not by the attainment of the end which he desires. Dealing with the question of housing and town planning, Mr. Palmer condemned the idea of standard cottage designs on the score of monotony. We agree with him in so far as it is certainly undesirable to develop a whole district with cottages built on one uniform plan. But the adaptation of one of a number of standard designs to the needs of any individual scheme is another matter, and has much to commend it on the ground of economy. There can be no question as to the desirability of speeding up the procedure for obtaining sanction to town planning schemes. Again, it is not even now so well recognised as it should be that the broad outline of a town planning scheme is essentially a matter for the municipal engineer, although he will often be wise to consult the architect, the landscape architect, or other experts on particular aspects of the work. Mr. Palmer did well to emphasise these points. As a whole, the address showed that the new president worthily represents his colleagues, and has a sound conception of their present needs and aspirations. We are only expressing the general opinion in wishing him a prosperous and successful year of office.

* * *

The I.M.E.A. Report.

At the annual business meeting of the Incorporated Municipal Electrical Association on Friday last, several interesting topics came under discussion. First among these was the time-worn question as to the adoption of the "Model Conditions of Contract" of the Institution of Electrical Engineers, a highly contentious subject, as some of the managers of smaller undertakings consider certain clauses to be drawn too much in favour of the manufacturers. These clauses have been before the Association of Municipal Corporations for nearly four years, but the I.M.E.A. is still unable to induce that body to pronounce an opinion upon their merits. This year the council asked the meeting to rescind the resolution of 1913 which required them to submit the question to the Association of Municipal Corporations, and to give them power to settle the matter independently; but once more the opposition was too strong, and the council have not obtained so free a hand as they desired, the decision having to come up for review before it is carried into effect. A Bill embodying a number of reforms urgently required in connection with the supply of electricity, such as compulsory wayleaves, facilities for charging electric-vehicle batteries, &c., has been drafted, and good progress has been made by a committee in connection with the linking-up of electricity works. The constitution of the council was amended by providing for the representation of the smaller undertakings, and a postal ballot was adopted. The report of the "Electric Vehicle Committee of Great Britain"— the new title of the committee originally formed by the I.M.E.A.—showed satisfactory progress, there being now over 200 charging stations, while the number of electric vehicles in use or on order has increased from 680 last year to 914 this year. But the electric vehicles can now neither be made nor imported except for purposes connected with war work.

* * *

Electricity in Agriculture.

An important feature of the report of the council of the I.M.E.A. was the announcement that a committee had been formed for the development of electricity in agriculture, on

similar lines to the Electric Vehicle Committee, which has proved so successful. The committee has a nucleus of six members of the association, who may add to their number from any source, and is to investigate the problems underlying the supply of electrical energy for lighting, power, heating, and plant culture, to farms, villages, and rural industries. At first sight the scope of the committee's activities would seem to be somewhat limited and the field unpromising, but in point of fact it offers immense possibilities, and is of particular importance at the present juncture, when every possible means of increasing the supply of home-grown food must be utilised to the utmost. The trust reposed in automobile tractors for ploughing the extra 3,000,000 acres has proved fallacious, for it is found that the tractor cannot deal with more than about 60 acres a week, working day and night, and its work is partly nullified by the compression of the soil resulting from the weight on the wheels. On the other hand, ploughs hauled to and fro by cables driven by electric motors can accomplish a vast amount of work at moderate cost, and without compacting the soil. Another factor in the problem is the scarcity of labour, which can be met by the adoption of electric power for a variety of purposes on the farm, on lines which have been well tried out on the Continent. In addition, electric lighting enables work to be carried on at night; and, lastly, the science of electroculture is now arriving at the stage of practical measures, holding out the prospect of increasing the amount of produce from a given area by as much as 50 per cent—the figure attained in experiments carried out under Government supervision last year. The essential feature of electroculture is the stimulation of growth by the maintenance of a high-pressure electric charge on a system of fine wires suspended over the crops, at a height of 6 ft. or 8 ft. from the ground; the apparatus required is simple and comparatively inexpensive, and the amount of energy expended is so small as to be practically negligible in cost. Bearing in mind that agriculture is still our greatest industry, as measured by the number of persons employed, and that the advantages of a supply of electricity for lighting and cooking would be eagerly availed of in country villages, it will be seen that the subject is one of the first importance to the nation. But until the supply is available, none of its benefits can be realised, and thus the matter is intimately bound up with the question of overhead wayleaves, to which we recently referred, for without overhead wires the rural areas cannot be given a supply of electricity. It is to be hoped therefore that every effort will be made to induce Parliament to afford facilities for this purpose at the earliest possible opportunity.

* * *

Housing the Working Classes.

This difficult and economic problem will not be satisfactorily settled until capitalists and leaders of the working men realise that capital and labour must go hand in hand—that capital without labour is useless, and that labour cannot live without capital. It is interesting to find that so long ago as the year 1846 a Monsieur Godin opened large ironworks at Guise, in the department of the Aisne, France, and very soon discovered that the right manner in which to found a successful business was to look after his workmen and their families. He built the famous "familistres," huge social palaces, in which about 400 families live, and also institutions, schools, co-operative stores, libraries, theatres, and so forth. The whole settlement comprises about 86 acres, of which 11½ acres are covered by the ironworks, 25 acres by public gardens and co-operative gardens, and the rest by the "social palaces," schools, institutes, and other buildings. He began sharing profits with his employees in 1877, and in 1880 he formed the works, "familistres," and everything else, into one great co-operative society, with certain provisions for the whole to become the property of the workers. There were then about 1,500 persons employed in the works, and the scheme prospered and grew until now the "Cité Ouvrière" is a well-known term among French economists to describe the best method of settling the housing question. Some of our larger employers of labour have followed this excellent example set by Monsieur Godin more than seventy years ago, but so far it has never been followed to the full extent to which that large-minded man carried his sound theories, with good results to his own pocket and to the well-being and social improvement of his workpeople. Such a scheme encourages self-reliance among the people. Which of our merchant princes will be the first to follow Monsieur Godin's example?

* * *

Junior Engineers.

The rapid and continuous growth of the Junior Institution of Engineers since its foundation "by a few apprentices at the engineering works of Messrs. Maudsley, Sons & Field, Lambeth, London," in 1884, affords the best possible evidence that those responsible for its management have always had the faculty of adapting its usefulness to the current requirements of the members. The council of the institution have recently had under consideration the question of formulating the conditions under which youths intending to enter the engineering profession, or train for staff appointments in engineering works, may be admitted to the institution, and a special committee was appointed to deal with the matter. This committee has now reported on lines which are at once novel and interesting. Their proposal is that a "Cadet" class of Associate Member shall be created, by which admission to certain privileges of the institution shall be extended to youths of fifteen years of age and over who are either enrolled students of an approved technical college or are serving as apprentices. "Cadet" Associate Members will be entitled among other privileges to attend meetings and visits, to seek advice from the council on matters concerning their professional careers, and to use the library and reading room. It is further proposed that in the event of a sufficient number of "Cadet" Associate Members—as may be so deemed by the council—being attached to one or more technical colleges or schools, or one or more approved engineering works in a particular district, such groups may be provided with copies of technical papers as may be read from time to time before the institution, in London or elsewhere, and special meetings may be arranged whereat such papers may be read, explained and discussed under the direction of an officer, hon. member, or member of the institution visiting or resident in such district. The scheme appears to have been well thought-out, and its adoption should result in attracting a large number of young recruits to the ranks of the institution.

Fuel Economy.—In a paper on this subject presented at the recent annual meeting of the Incorporated Municipal Electrical Association, Mr. J. A. Robertson, borough electrical engineer of Salford, said that, in order to secure the most economical utilisation of the national coal supplies, it was necessary to centralise the production of electricity on a large scale, and to adopt a scheme for its distribution over suitable areas formed without regard to existing municipal boundaries. The consequent cheapening of production would ensure the general use of electricity, and would result in a saving in fuel now consumed in factories and for domestic purposes of not less than 30,000,000 tons per annum.

Extraordinary Traffic and Excessive Weights on Highways.*

By H. T. WAKELAM, M.INST.C.E., County Engineer, Middlesex.

In his recently published book on "Practical Roadwork" the writer stated, *inter alia*, that "quantity, quality, and time (or the mode of user)" were three of the most important factors which came within the category of extraordinary traffic, as defined in the judgment given by the courts in the celebrated case *Hill* v. *Thomas* in 1893—Q.B. 340. The writer also stated that under certain conditions it would appear that motor omnibus traffic would also be defined in the courts as being of an "extraordinary" character, more especially so in the case of a road which had not been constructed to carry heavy traffic of a continuous nature, and had been previously subjected only to ordinary light traffic such as that met with in most provincial towns and in the more suburban and rural areas.

The writer further remarked that the principle of compulsory contributions by motor omnibus companies towards the upkeep of roads traversed by their vehicles had already been laid down in private Acts of Parliament, and that this factor should go a long way towards securing an adoption of the same principle by the judges of the High Courts.

THE ABINGDON CASE.

Since this book was published a claim for extraordinary traffic has been prosecuted in the King's Bench Division of the High Courts by the Abingdon Rural District Council against the Oxford Tramways Company, in connection with damages caused by motor omnibuses to roads over which the district council exercised management and control.

The claim was made the subject of a test case which resulted in a decision being given by Mr. Justice Sankey in favour of the council, the latter being awarded an amount for damages which worked out at about 3½d. per car mile for the motor omnibus traffic concerned. The result of the case is a justification of the opinion of the writer as expressed in his book on "Practical Roadwork."

To remove some misconception which has arisen since the hearing of the Abingdon case it is as well, perhaps, that the members of the institution should know that the roads in the Abingdon district traversed and damaged by the motor omnibus traffic in question are not of the character of mere country lanes, as has been stated since the hearing of the case.

The routes affected by the traffic are to a great extent connecting links between the boundary of the city of Oxford and the boundary of the borough of Abingdon, and, although the said links are not within the category of "declared main roads," they are nevertheless of more importance than some of the "declared rural main roads" of the kingdom.

In giving his decision in the Abingdon case, Mr. Justice Sankey stated:—

"That whether particular traffic was extraordinary must be a pure question of fact in each case. Counsel for the defendant said that this was the first case in which it had been sought to make the owners of motor omnibuses liable for extraordinary expense on the ground that such traffic was extraordinary traffic. He (his lordship) thought that the statement did not advance the solution of the problem, which depended on the circumstances in which the omnibuses ran over the road. On some roads, like the Strand, motor omnibuses were not extraordinary traffic; on the roads one was just as likely to meet a mastodon as a motor omnibus, and in such cases it could not be said that the running of a motor omnibus along the road was 'ordinary' traffic. The defendants' omnibuses were much heavier than any other traffic on the roads in question before the advent of the motor omnibuses, and a census of the traffic, which was taken from September 28 to October 4, 1915, showed the great preponderance of the omnibuses over any other motor traffic of comparable weight along the roads. Counsel for the defendants said that the question was whether a service of omnibuses run to serve the needs of the district could be extraordinary traffic. He (his lordship) was unable to see how the demand of a district for traffic which was extraordinary could turn that traffic into 'ordinary' traffic, although the traffic might be necessary traffic and might in the future become 'ordinary' traffic. The only thing, however, which he had to consider was the present traffic over the roads as they were at the present time. He (his lordship) came to the conclusion that the traffic was extraordinary traffic; that the roads had been properly kept up; that the plaintiff had incurred extraordinary expense; and he gave them judgment, accordingly, for £350 of the amount claimed."

In connection with the award of Mr. Justice Sankey the Oxford Tramways Company appealed in the courts against the above decision, but without success.]

As will be seen, the decision of Mr. Justice Sankey fully supports the view that "quantity, quality, and time" (or the mode of user) are the chief factors to be taken into account when claims for extraordinary traffic are being contemplated and formulated.

Shortly after the passing of the County of Middlesex Great West Road Act, in which a clause was granted by Parliament empowering the county council to make a charge of ¾d. per car-mile in connection with all motor omnibuses which use the road when the latter is constructed, Parliament sanctioned the appointment of two committees, one to inquire into the construction of motor omnibuses, with a view to improvements in their design, and the other to inquire into the question of the amount (if any) the owners of such vehicles should contribute towards the upkeep of roads traversed by such omnibuses.

The first named committee has now been sitting and taking evidence for some months, but, owing to the war, the other committee has not yet been formed.

CONTRIBUTIONS.

In connection with the principle underlying the proposal of contribution, and to meet the extraordinary position in which highway authorities generally have been placed by the extra expenditures they have had to incur to make good the damage caused to roads by motor omnibuses, a clause to meet the case was inserted in what is known as the Local Government (Emergency Provisions) Act, 1916.

Unfortunately, the clause referred to is not quite clear as to what is meant by the term "regularly used," but whatever was intended when the clause was framed, it is clear that all new omnibus services have to receive the consent of the highway authority exercising jurisdiction over the area in which any roads affected by the Act are situated, and on which it is proposed to instal new services. As the latter point is made quite clear in the Act, it is both important and desirable that terms should be satisfactorily arranged between the parties interested, in connection with and previously to the commencement of any such services.

Obviously attention in this direction must first be given to the character, strength, and state of the roads over which any new services are to run; it is quite clear that roads of different strengths and formations must be placed in categories relative to the degree of the resistance they will afford to the stresses to be imposed upon them by subjecting them to the sudden impacts of motor omnibuses—than which, in the opinion of the writer, there is no road vehicle at the present time which causes greater tests and shocks to road surfaces.

As a guide to procedure in the matter of contributions to be paid by omnibus companies for using roads under the provision contained in the Emergency Act, 1916, the writer a short time ago prepared the following table of rates for consideration by the members of the County Surveyors Society:—

OMNIBUS TRAFFIC.

* Basis—100 miles per day.

	Per 'bus mile.	Per 'bus per annum.
	d.	£ s. d.
(*a*) For a specially constructed wood paved or asphalted road on reinforced concrete	⅜	57 0 0
(*b*) For a wood paved road (on concrete)	7/16	66 10 0
(*c*) For an asphalt road (on concrete)	7/16	66 10 0
(*d*) For a granite sett or Durax paved road (on concrete)	7/16	66 10 0
(*e*) For an asphaltic macadam road	½	76 0 0
(*f*) For a tarred slag macadam road	¾	114 0 0
(*g*) For a tarred limestone macadam road	¾	114 0 0
(*h*) For a tarred granite macadam road	¾	114 0 0
(*i*) For a granite waterbound road	1	152 0 0
(*j*) For a limestone waterbound road	1	152 0 0
(*k*) Other waterbound roads ...	1	152 0 0

* A less mileage per day can be easily calculated on this basis.

* Paper presented at the annual meeting of the Institution of Municipal and County Engineers at Hastings.

	Per 'bus mile. d.	Per 'bus per annum. £ s. d.
(*l*) For a road partly wood paved and partly macadamised with waterbound metalling ...	1½/16	104 0 0
(*m*) For a road partly wood paved or granite paved and partly macadamised with waterbound metalling	1½/16	104 0 0
(*n*) For a road partly paved with wood and partly macadamised with tarred macadam... ...	9/16	86 0 0
(*o*) For a road partly paved with setts or Durax and partly macadamised with tarred macadam	9/16	86 0 0
(*p*) For a road partly wood paved and partly paved with setts or Durax	7/10	66 10 0
(*q*) For a road partly paved with wood and partly with asphaltic macadam	¼	76 0 0
(*r*) For a road partly paved with granite setts or Durax or partly with asphaltic macadam or Lithofalc	½	76 0 0

The denominations given may not of course be suited to each particular case, but as a basis for calculations the figures will probably be found useful. A flat rate for contributions throughout the country in respect of roads of all standards could not be held to be fair, nor would it be reasonable. The table was prepared only from the point of view of an exemplification of what might, with the necessary modifications, form a basis for settlement in any particular case.

The writer is quite aware that the rates proposed in the table do not by any means cover all the damage caused by motor omnibuses; but it must not be forgotten that when consents for new services are being sought by operating companies public utility and convenience should not be overlooked, and that in this connection it will probably be better to endeavour to arrange mileage rates which will give monetary compensation to a degree sufficient to reimburse a road authority for the damage caused to the roads, with correlative considerations to cover, by estimation if possible, the value of the proposed services to the travelling community and to those living in the immediate areas in which the omnibuses will run. Most of the members of the institution will probably accept this view as being of a sound nature.

BASIS OF CONTRIBUTIONS.

The writer is fully aware that in some cases damage to the extent of from 5d. to 8d. per mile, or even more, has been caused in the past by motor omnibus traffic on waterbound roads.

Clause 20 of the Emergency Act, 1916, should preclude a repetition of this burden on ratepayers. Under its provisions highway authorities have the power to veto (subject to the Local Government Board) any new services over roads which possess inherent weaknesses—such as those which have already been so much damaged by omnibus traffic in different areas. Should an authority refuse to consent to the installation of a service on any given road, or fail to come to terms with the company applying for consent, the latter has the power of appeal to the Local Government Board. In the event of any such appeal being upheld, it should not be forgotten that there is still the Extraordinary Traffic Act to fall back upon, under which the authority suffering damage from any such services would probably recover more from the offending company than the authority would receive on an agreed and prearranged contribution basis. When negotiating, members of the institution should not lose sight of this important fact, although, as the writer has already stated, it is important and desirable, before any new services are started, for terms satisfactory to both parties to be agreed.

As time goes on, and motor engines are improved, both working and running charges will in all probability decrease; it would be well, therefore, in connection with any terms agreed, to reserve power to revise the rate of contribution every six months. Instead of 10½d., or more, being expended per car-mile for working charges, as at present, they may come down as low as 6d. or 7d., in which case the operating companies could afford to give better contributions to highway authorities—hence the need for the reservation suggested.

Some time ago it was stated in Parliament that during the year 1913-14 something like 105,000,000 miles were run by motor omnibuses in London and Greater London. This mileage at 2d. per car-mile would produce about £875,000; and at 1d. per car-mile a contribution of about £432,000 a year would become due from the operating companies. The writer believes that the average takings of the companies in London and Greater London is about 1s. 2d. per car-mile, which, taking the total mileage already mentioned, works out at £6,125,000 approximately. Taking the working charges at 10d. per car-mile (on the mileage run) gives an amount of £4,230,000 expended in this connection, leaving a balance of about £1,805,000 to the credit of the operating companies.

As a rule, the fares charged per mile in the more provincial areas are higher than in London and Greater London, while the working and establishment charges are less, owing to the lower rates of wages, &c., paid in those areas. Considering these factors, owners of motor omnibuses plying for hire in provincial areas should be in a position to pay a greater contribution per mile than in London or Greater London, and especially so as the chances are that the latter are provided with much stronger roads than those generally met with in the majority of the provincial counties and towns.

The total mileage figures above given refer to the year preceding the outbreak of war, since when conditions have changed, working charges and the cost of petrol, &c., now being much higher. These factors should be taken into consideration when mileage rates are being arranged, and should cause stronger reasons for reserving power to rearrange such rates every six months than would appear to be necessary in more normal times.

Since the table of rates just given was prepared agreements have been entered into between some of the provincial counties and motor omnibus companies in regard to the payment of contributions on a mileage basis in respect of new routes to be traversed. The rates arranged have been as follows:—

(*a*) Twopence per car-mile on water-bound roads, ¾d. on tar-macadam roads, and 2d. per car-mile on roads having Tarmac centres and water-bound sides.

(*b*) Threepence per journey over a length of about ¾ mile of road formed with gravel (tar-sprayed), and 2d. per car-mile on a Clee Hill macadamised road.

(*c*) One penny per car-mile on a macadamised road—negotiations proceeding.

Negotiations are also proceeding in other counties where new routes have been suggested by motor omnibus companies.

CAUSES OF DAMAGE TO ROADS.

Although perhaps a little irrelevant to the subject-matter of this paper, the writer thinks that it may not be misplaced if he states here that, in his opinion, the chief factors tending to the damage to carriageways caused by motor omnibuses are:—

(*a*) The extraordinary vibration set up by the high speeds at which the omnibuses travel and the abnormal stress and impact they cause.

(*b*) The suction and wear caused by the twin tyres (especially after comparatively little use) with which the wheels are fitted.

(*c*) The unequal distribution of the loads carried by such vehicles.

With regard to item (*b*), the writer is of opinion that the steel tyres of heavy motor lorries, travelling with the authorised loads and at the regulation speeds, are no more destructive to road surfaces than indiarubber tyres (after wear), owing to the "bouncing" action set up by the use of such tyres when the omnibuses are travelling fully laden and at high speeds. If the wheel bases of motor omnibuses were longer the vehicles would probably lose a great deal of the "bouncing" action, and would cause less damage to the roads.

After the exhaustive inquiries by the special committee appointed by the Local Government Board to consider the question of damage to road surfaces caused by the use of motor omnibuses, one may look for some improved regulations governing the build and running of such vehicles.

Adverting to item (*a*) the writer would state that there is a well-known hill in Middlesex with an average gradient of about 1 in 13. Motor omnibuses climbing that hill have to travel at a low speed, and, owing to the configuration of the surroundings at the bottom of the hill, the vehicles have also, perforce, to proceed slowly down the gradient. The result is that a coating of Clee Hill metalling, with which the hill is covered (tar-painted each year), will last about three years. Directly the omnibuses reach the top of the

hill a practically level surface commences, along which the omnibuses quickly gather speed. This surface is also covered with water-bound Clee Hill metalling, which under the high speeds of the omnibuses lasts only from four to six months. The same conditions apply to the surface of the road adjoining the bottom of the hill. This road is also comparatively level. Here, again, water-bound Clee Hill stone will last only from four to six months.

The writer is of the opinion that the above instance, showing the results of actual traffic under high and low speeds, proves that, to prevent extraordinary damage to roads by motor omnibuses, an issue of amended regulations as to the speeds at which such vehicles may travel, or a reduction in the size and weight of the latter, are of paramount importance.

THE ROAD ENGINEER'S CERTIFICATE.

In connection with the law of "Extraordinary Traffic on Highways," a certificate signed by the road engineer generally forms a condition precedent to the prosecution of any claim in respect of damages caused by an extraordinary road user. Any extra expenses incurred in the latter connection should be carefully set out, with sufficient detail for a clear consideration to be exercised, and a perfect understanding of the facts to be obtained, by the legal adviser. The certificate should be carefully prepared, and before proceedings are taken a draft of the proposed certificate should be submitted to and approved by an advising counsel of experience. In this way pitfalls and technical points in connection with legal proceedings—not easily understood by the layman—will be avoided. A small expenditure incurred in this direction will be far better than spending a large amount to find at the end that the proceedings have been upset on a technicality which might by the exercise of a little foresight have been avoided.

Another point, in the writer's opinion, is that no road engineer should be saddled with the responsibility of the final drafting of the necessary certificate. He is not, as a rule, competent to deal with technicalities involving legal knowledge, and road engineers should be chary of accepting responsibility of this kind. In some cases which have been before the courts the certificates issued by road engineers have not been such as to withstand that close scrutiny to which they have been subjected by counsel appearing on behalf of the defendants, and it is therefore necessary that the greatest care should be exercised in the preparation of the certificates forming the basis of such claims.

To prove the necessity of this the result of a recent case may be quoted. The learned judge, in deciding the case, stated that—"the certificates failed in several important details. They contained no details as to the cost of upkeep of roads similar to those claimed for. Neither had such cost had any consideration by the plaintiffs, and therefore such cases could not succeed."

Within a comparatively recent period several other extraordinary traffic claims have failed in the courts, while many have succeeded. In connection with the latter perhaps a proper preparation of the certificate has been the greatest factor towards success, and the writer would emphasise the extreme desirability for the greatest carefulness to be exercised in this direction if such claims are to succeed.

PROSECUTION OF CLAIMS.

Claims under the Extraordinary Traffic Act must be prosecuted within twelve months of the time of the damage being caused. Only so much of the damage can be claimed for as was done within twelve months of the date of the writ. In cases where damage was going on previously to twelve months of the said date evidence must be given to show and prove the damage caused within the twelve months' period. It is also necessary in such cases to show the amount of the expense incurred in making good the damage before the date of the writ.

As already stated it is always desirable for the road engineer to accept no responsibility in regard to the preparation of extraordinary traffic claims. His function is to call the attention of his authority to any damage caused by traffic which cannot be considered to come within the category of "the ordinary traffic of the district," and to furnish all necessary details of the expenditure incurred and returns or records of such traffic, together with the numbers of journeys and the tonnage carried per diem. He should be in a position to prove by evidence all the details he furnishes, and to prove conclusively the quantities of extra materials expended by reason of such traffic; also to suggest persons who, from local knowledge, can support his views as to the traffic being of a nature foreign to the "ordinary local traffic."

In addition to the provisions contained in the Extraordinary Traffic Act, there are certain clauses in the Public Authorities' Protection Act, 1893, which apply to cases of the kind. These clauses contain, and impose upon local authorities, provisions as to time limits for the prosecution of extraordinary traffic claims. A perusal of the latter Act is both advisable and instructive to those whose duty it may become to take action in what are somewhat difficult cases to fight, and especially so if the fullest details and the best possible proof as to the damage caused are unavailable.

Two other important points to be remembered in connection with contemplated cases are:—

(*a*) To test whether, and be able to prove that a road which forms the subject of a claim had not been constructed to carry heavy traffic of a continuous nature.

(*b*) To be able to prove that the traffic claimed for was practically continuous.

Given the above factors, supported (1) by a certificate properly framed; (2) by good evidence as to the comparable upkeep costs of similar roads in the immediate neighbourhood; (3) by good evidence from responsible people living in the immediate locality; (4) by clear details of the extra maintenance costs incurred to make good the damage caused; and (5) by authentic records of the extraordinarily laden vehicles passing over the roads, it is somewhat difficult to believe that claims for extraordinary traffic will fail in the courts when left in the hands of counsel well versed in such matters.

As already stated, there have been both successes and failures in the prosecution of extraordinary traffic claims. Failures, after costly litigation, are always unpleasant; hence a desirability to settle, if possible, on prearranged terms the rates to be paid by persons "causing," or about to cause, traffic of an unusual character in any particular instance.

The writer emphasises the word "causing" owing to the fact that in all cases it has been held that the person, or persons, "in consequence of whose order" extraordinary traffic has been caused should be proceeded against. It is not sufficient for an agent or a contractor who carries on such traffic to be sued, nor for proceedings to recover compensation for damages caused by traffic outside that which is considered to be ordinary in any particular area to be taken against either an agent or a contractor.

When it is known that there is likely to be a continuous haulage of materials, plant, timber, &c., of a special kind over any given road, the road engineer in charge of the latter should communicate with the person "in consequence of whose order" the traffic is to take place, with a view to settling a rate—at so much per ton per mile—agreeable to the parties concerned.

In several cases such a procedure has been successfully followed. The prearranged terms have ranged from 1½d. to 5d. per ton-mile (or even more), in ratio to the varying strengths of the roads affected. Railway weights, or checkings by weighbridges, have usually formed the basis for payment. The accounts kept by the firms interested have in some instances been utilised to furnish the necessary data for calculating the amounts due to the authorities concerned.

In connection with the question generally the writer is quite certain that no authority has the least desire to throttle industry or trade; further, that it is only in the interests of those who have to pay for the upkeep of roads that steps are taken to safeguard their interests and to recover in equity what they are fully entitled to when traffic is of such an extraordinary nature as will cause an expenditure much above that ordinarily incurred in maintaining roads to a standard sufficient for the ordinary traffic of the neighbourhood in which they are situated.

The test of "excessive weight" is the "ordinary" traffic on any particular road, and not on the other roads of the neighbourhood. The fact that "excessive weights" have been taken over given roads as the result of a particular industry is no answer in respect of an action taken in regard to it if such traffic had previously been confined to other particular routes. And likewise in regard to timber traffic. The fact that timber is ordinary produce does not exonerate a person from his responsibility for damage caused to roads by its haulage should it be carried over a road in a greater number of loads than had formerly been

the case. Timber traffic, in the ordinary sense, is not held to be "extraordinary traffic," but it has been held to be so when hauled in excessive quantities.

Traffic caused by any one person is not held to be "extraordinary," even though he uses a road more than his neighbours. To render him liable he must use the road to an "extraordinary degree" in comparison with the "ordinary user" as a whole, by all who use it. A sound course to take in this connection is to prove, by records of traffic, the tonnage carried per diem by the person whose traffic is in question, in comparison with the total tonnage per diem of the other traffic on the road. The records should be carefully taken, authenticated, and vouched for in evidence by police officers or by some intelligent and disinterested person or persons.

Another important point is that in a case in which a person has given orders for large quantities of material to be delivered he is not necessarily responsible at law if the persons who supply the said material overweight their vehicles.

Among other judgments of the courts, those given in the following cases are often quoted as precedents of importance in relation to the subject-matter of this paper—viz. :—

Hill v. *Thomas* (1893), 2 Q.B., 333 C.A.
Kent County Council v. *Gerard*.
Wolverhampton Corporation v. *Salop County Council* (1895), 64 L.T.
Geirionydd Rural District Council v. *Green* (1908), 72 J.P., affirmed (1909), 2 K.B., 845 C.A.
Tonbridge Highway Board v. *Sevenoaks Highway Board* (1884), 49 J.P., 340.
Shepton Mallet Rural District Council v. *Wainwright* (1908), 72 J.P., 459.

The above cases have been selected owing to the fact that they dealt with traffic of various kinds and under different conditions. There are, however, many other decisions which may be perused with much interest.

Rural district councils are entitled to sue for damages caused by extraordinary traffic in cases in which the roads have been vested in them as the highway authority, under sec. 11 (4) of the Local Government Act, 1888.

RAILLESS TRACTION.

A word on the provisions inserted in clauses in recent private Acts of Parliament in regard to railless (or trolley) traction on roads, with the obligations imposed in regard to the principle of contribution underlying this kind of traffic, may be of some interest. The writer believes he is correct in stating :—

(1) That under the Stroud and District Tramways Act, 1913, the company have to pay the highway authority any additional expense they may be put to in repairing and maintaining roads by reason of the use of trackless trolley omnibuses.

(2) That under the Aberdare Urban District Council Act, 1911, it was made obligatory that the said district council should pay the county council one-third of the cost of repairs necessary to the roads to carry trolley omnibuses ; and, further, that the county council may carry out road improvements, towards which the district council must contribute half cost.

(3) That, under the Brighton and Hove Railless Traction Act, 1911, the promoting company has to pay the highway authority one halfpenny per car-mile, with a minimum of £120 per annum, and if the said payment be found insufficient any additional sum to be settled by arbitration.

(4) That, under the Rotherham Corporation Act, 1912, the corporation, if required by the county council, are to widen roads used to a width of 27 ft., three-fourths of the cost of widenings to be paid by the corporation and one-fourth by the county council. The corporation, in addition, have to pay three-eighths of a penny per car-mile, with a minimum of £150 per car per annum, and any additional sum to be settled by arbitration.

In addition to the above, varying obligations were placed on the promoters in each of the following Acts —viz. : The Keighley Corporation Act, 1912 ; the Ramsbottom Urban District Council Act, 1912 ; the Sheffield Corporation Act, 1912 ; the North Ormesby, South Bank Traction Act ; the Morley Corporation Act ; the Rhondda Railless Traction Act ; the Mexborough and Swinton Tramways Act ; the Western Valleys Act ; and the Metropolitan Electric Tramways Act.

Considering the above, it can be assumed that Parliamentary Committees (and in fact Parliament itself) have recognised the unusual wear and tear to roads caused by railless traction, and have, in effect, pronounced it to be "extraordinary" in character. Under the circumstances it appears that, in opposition to private Acts, such as those above mentioned, highway authorities may well claim that railless traction sets up traffic of an extraordinary character, and that the promoters of any such systems of traction should pay a fair contribution towards the upkeep of the roads they use. In this connection it should be remembered that the owners of railless trolley systems are liable to be rated in the districts in which they operate, whereas motor omnibus companies are not subject to any such liability. Under these conditions it is fair to state that the latter should therefore pay more per car-mile in connection with their traffic, *per se*, for the upkeep of the roads they use than is paid by the former for the same privilege.

MOTOR CARS IN PUBLIC SERVICE.

COST OF UPKEEP AND RUNNING OF FIVE TYPES OF VEHICLES.

Under an arrangement made some years ago, it is the custom of the Finance Committee of the Metropolitan Water Board to report to that authority periodically the cost of upkeep and running of the Board's motor cars. In view of the present petrol situation in relation to the war, it has been represented to the Board that the above statement from the Finance Committee should be submitted.

Particulars.	Five cars for year ended 31st March, 1916.	Five cars for year ended 31st March, 1917.
	£ s. d.	£ s. d.
Working cost per car—Actual H.P.—		
Daimler ... ... 41·6	577 1 5	676 18 6
Wolseley ... ... 32·4	377 11 5	331 15 10
Siddeley ... ... 25·6	390 4 2	242 12 8
F.I.A.T. 30	482 0 2	379 12 10
Ford 20	199 18 5	266 1 8
	£1,836 15 7	£1,897 1 6
Details of Working Costs—		
Wages—Drivers	537 2 11	589 18 3
Cleaners	107 5 9	126 6 10
Fitters	243 17 1	146 5 11
Tyres, covers and tubes	239 4 6	193 4 6
Motor spirit, lubricating oils and sundries	414 13 2	591 6 11
Repairs and renewals	144 9 11	103 19 1
Clothing	50 0 7	54 7 0
Licences	66 15 0	54 3 0
Insurance	33 6 8	37 10 0
	£1,836 15 7	£1,897 1 6
Miles run—		
Daimler	13,681	14,193
Wolseley	13,296	5,954
Siddeley	7,865	7,544
F.I.A.T.	11,139	7,913
Ford	12,818	7,440
	58,799	43,044
Working cost per car mile—	d.	s. d.
Daimler	10·12	0 11·44
Wolseley	6·81	1 1·37
Siddeley	6·10	0 7·71
F.I.A.T.	10·38	0 11·51
Ford	3·74	0 8·58
Average working cost per car mile ...	7·49	0 10·57

The National Physical Laboratory.—A report upon the work of the National Physical Laboratory during the year 1916-17 was presented at the annual meeting of the General Board held on the 19th inst. The investigations carried out have been, in the main, of confidential character, and no details are given in the report. It has only been possible to make progress with a very few of the researches undertaken prior to the war, and these are almost entirely closely connected with war problems. The laboratory is at present under the control of a General Board and an executive committee appointed by the Royal Society and the great technical institutions, and the researches are assisted by a grant from the Treasury. The income during the past year was over £70,000, an increase of nearly £20,000 over that of the preceding year. The major part of this total is received in payments for work done, and this involves a serious financial liability. Much attention has been given recently to the question of the future of the laboratory, and in particular to its relations with the Department of Scientific and Industrial Research, and a scheme will no doubt be arranged by which close relations with the department will be established.

ROAD MAINTENANCE IN HEREFORDSHIRE.

By G. H. Jack, M.Inst.C.E., County Surveyor.[1]

I feel that it would be a waste of words to make any attempt at even outlining the great difficulties which have been experienced in the task of maintaining the roads owing to all the troubles arising out of the war, coupled with the effects of an unusually long and severe winter.

Since the year 1914 the estimates for rural main road repairs have been underspent as follows: 1914-15, £3,070; 1915-16, £10,238; 1916-17, £16,623; total, £29,931. It is true that motor traffic has decreased during these years, but on the other hand destructive engine traffic in connection with timber haulage has never been heavier.

The failure to spend so large a sum as £29,931 in three years is sufficient in itself to explain the poor condition which many miles of county roads now present. To bring the roads back to what they were I estimate will cost approximately double the amount not spent in past years.

COST.

The mileage of the main roads remains the same, viz., 501. The cost per mile for the year just ended works out as follows: Rural roads, £40·3; urban roads, £154·3; compared with the year before the war, rural roads, £79·3; urban roads, £193·5.

TIMBER TRAFFIC AND ROAD DAMAGE.

The unprecedented amount of timber now being cut and hauled over the main roads of Herefordshire is likely to be a serious matter for the county ratepayers. Roads in the Wigmore, Leominster, Hereford, Ledbury and Bromyard districts have been reported to me as suffering special damage. Efforts are being made to arrive at some amicable arrangement by which the cost of reinstatement may be met by those responsible for the damage.

VALUE OF ROAD BOARD WORK.

Among all the adverse circumstances at present prevailing there are two factors which give cause for satisfaction. First, the co-operation with the Road Board in the laying out of a large sum of money during the last three and a-half years in strengthening our most used roads, has resulted, not only in their preservation, but also in a considerable lowering of the cost of maintaining these roads. Had the work been suspended as suggested at one time many lengths would undoubtedly have given way entirely during the very trying conditions of last winter. Second, the policy which the committee adopted some nine years ago in spending additional money upon strengthening the sides of the roads and on the abolition of the practice of using earth for binding instead of clean material, is responsible for the much longer life of many miles of road. Surprise has often been expressed at the manner the roads have stood the severe tests recently imposed upon them.

Since the Road Board work started in 1913 the following material has been used: In foundations, 26,713 tons; for surfacing, 19,510 tons; total, 46,223 tons.

During the last two years it has been very difficult and [illegible] rather costly to continue this good work. The loss of my technical staff, the high cost and difficulty of obtaining materials, labour, and haulage plant, have all seriously hampered the work. Nevertheless, a small gang of men has been continuously kept at work, and many lengths of road which had already become dangerous dealt with and made good.

Water Board Employees and Military Service.—The Metropolitan Water Board decided on Friday last that, having regard to the supreme importance of maintaining the water supply to the Metropolitan area, coupled with the fact that the demands of the War Department for military service have already reduced the board's staff to a most serious extent, it appeared that the services of the bulk of the officers and men remaining in the water administration were indispensable to its efficiency. For these reasons the board was unable to give a general authority for members of the staff over the present military age to attest voluntarily for service in his Majesty's Forces, but the General Purposes Committee was authorised to grant leave, at its discretion, in the case of any such members of the staff [illegible] to attest was approved by the chief officer of the department.

[1] Extract from Annual Report for year ended March last.

THE TRIBUNALS.

At the Shoreham Tribunal the urban district council wished to retain the services of the head carter, 41 (general service), and he received three months.

At the Brighton Local Tribunal on Monday the borough surveyor supported an application for a sewerman (40, A). He said this man was doing very important work, the section of the sewer which he looked after on the front being dangerous if a storm arose, and requiring a man who was both strong and quick. Since the war he had lost three out of twelve sewermen, those left being all over military age, with the exception of this man.—Three months' exemption was ordered.

At Selby Local Tribunal the military representative (Mr. R. B. Parker) applied in the case of Mr. R. F. Braithwaite (32), married, Class A, surveyor to the Selby Rural District Council, for the withdrawal of his certificate of exemption. The rural council, represented by Mr. Harris Anson, chairman, applied for the exemption to be continued. The military representative said that the military authorities instructed him to appeal to the patriotism of men like this. Mr. Anson: It is not Mr. Braithwaite's application, it is ours. He has never expressed a wish to appeal. Mr. Anson went on to say that Mr. Braithwaite was surveyor of the highways and inspector of nuisances, and had control of 200 miles of roads, which were used for military or agricultural traffic. The council were being pressed to carry out an important road scheme, which would cost £2,000. The certificate of exemption was withdrawn, Mr. Braithwaite to join on September 6th.

ELECTRIC POWER SUPPLY.

MEMBERS OF THE DEPARTMENTAL COMMITTEE.

In the House of Commons on Monday Mr. Roberts (Parliamentary Secretary to the Board of Trade) replied that the members of the Departmental Committee on Electric Power Supply in England and the interests they represented were as follows: Mr. F. Huth Jackson, chairman; Mr. J. Falconer, M.P., Sir Charles Parsons, Sir John Snell, and Sir James Devonshire, Electrical Trades Committee; Mr. John Kemp and Mr. C. H. Herz, Coal Conservation Sub-Committee of the Reconstruction Committee; Mr. J. F. Crowley, Irish interests; Alderman C. F. Spencer, of Halifax, local authorities owning supply undertakings; Mr. G. H. Horne, London County Council; Mr. A. J. Walter, K.C., Ministry of Munitions; Mr. H. H. Law, Local Government Board; Mr. H. Booth, Board of Trade. The chairman had recently resigned on the advice of his doctor. The President of the Board of Trade was taking steps to appoint a new chairman, and also to increase the representation on the committee of local authorities owning electric supply undertakings, and he hoped to be in a position to announce the names in the course of a few days. He was unable to say when the committee would be in a position to make a report.

Hull Municipal Telephones.—Hull Corporation telephones have finished the year with a nett profit of £5,355, as compared with £3,645 in the previous year. Hull is the only municipality owning its own telephones, and the tariff is 33 per cent below the rest of the country.

The House Famine.—Application was made to the West Bromwich magistrates last week by the owners of two houses for an order to recover possession of the premises. Mr. J. Clark, who appeared in support of the application, said he was sorry to make it, but the houses were wanted to enable the owner to make extensions to premises. The trouble was that the tenants could not get other houses, and appeared to be "between the devil and the deep sea." It was stated by one of the tenants that he had tried to get a house at Oldbury, but was told there were 400 on the waiting list there. Mr. E. Wood (presiding magistrate) said this was a case of destroying houses at a time when they were badly needed. A short time ago it was reported that twelve people lived in a two-roomed house. He suggested that applicant should try to make some arrangement by which the tenants could find other accommodation. The cases were adjourned for a month.

Institution of Municipal and County Engineers.

ANNUAL MEETING AT HASTINGS: YESTERDAY'S PROCEEDINGS.

For a third and, it is to be hoped, the last time, the Institution of Municipal and County Engineers is holding its annual meeting under "war conditions." That the troublous period through which we are passing has not been without its effect on the gathering is evident from the programme—as modest a one as we are able to recall, though, it will be agreed, quite an excellent one, having regard to all the circumstances. More difficulty than usual has apparently been experienced in inducing members to prepare papers. Only four are down for discussion, but the smallness of the number should, at any rate, ensure that each will receive the measure of consideration which is due to their authors—in happy contrast to what has too frequently occurred in past years.

It was with every promise of success that the meeting opened yesterday morning in the Hastings Town Hall. A cordial welcome was extended to the members by the Mayor (Ald. George Hutchings, J.P.), who congratulated the institution upon having selected Mr. Palmer, the borough engineer of that town, as their president. Not only had they done honour to Mr. Palmer and to Hastings, but they had honoured themselves in electing Mr. Palmer. They knew, as Hastings knew, the value of his services. The relations between Mr. Palmer and the employees of the corporation had always been of a most cordial, agreeable, and loyal character.

Mr. Brodie, the retiring president, thanked the mayor for his welcome. Mr. Palmer's fame as a municipal engineer extended a long way from Hastings. He was known all over the country as a most successful engineer and a most courteous gentleman.

Mr. Brodie than installed his successor in office, and Mr. H. Percy Boulnois, in proposing a vote of thanks to the retiring president, said they had appreciated Mr. Brodie's urbanity, bonhomie, and marvellous tact.

Mr. A. E. Collins, in seconding, alluded to the time Mr. Brodie had given to the work of the institution during his year of office.

The resolution was carried with acclamation.

Mr. Palmer then rose to deliver his presidential address.

PRESIDENTIAL ADDRESS.

Allow me to express my thanks to the members of the institution for having elected me to be your president for the ensuing year; it is an honour I have not sought, but is one which I highly value, and trust that your choice may reflect credit on the institution, myself, and the corporation which I have had the pleasure to work for, for now over twenty-nine years. I need hardly say that it will be my endeavour to uphold the dignity of the office, and the prosperity and usefulness of the institution as a help to its members, and the progress of the profession as being one of the most complex and useful of avocations.

At a time when so many of its younger members are engaged in one way or another with the exigencies of this terrible war it will be no easy matter to keep the vitality of the institution up to a satisfactory standard; but I appeal to all to do their best, and work together for its good and to promote harmony among all classes of it members.

It is not an easy matter to obtain the number of useful meetings one would desire during the continuance of the war, but I hope it will be possible to arrange for at least two to be held in each district during the ensuing twelve months.

The council as a body are constantly striving for the welfare of the institution (and its members), and I feel sure that they well represent the members and have their interests at heart.

There is no doubt that after the war there will be great changes in life and general business methods, which will in a great measure apply to and affect the work and lives of the younger generation of engineers and surveyors. The universal competition will be such as to make production of materials a matter of scientific works organisation; and the possibilities cannot be taken full advantage of unless all industries are so organised as to utilise fully the latest inventions of self-acting machinery and plant and the best brains that can be obtained. It is therefore necessary that the engineer and surveyor should not only be well up in his own particular work, but he should be trained to organise and be a good business man.

The organisation of any big concern takes time, it cannot be hurriedly done, and cannot work smoothly without a deal of thought, patience, and attention.

The work of an engineer and surveyor to a large town or district requires careful organisation; and it is therefore necessary to have a homogeneous scheme, in which all the various departments will work together smoothly in order to make a success. This leads me to offer a few remarks on

ADMINISTRATION AND ITS PRINCIPLES.

We are living in times which call for great administrative ability, a demand which is not easily met. There are, of course, a large number of men whom one may say are endowed administrators; there are on the other hand large numbers who from various causes could never fill properly an executive position, no matter how fully tutored to assume its responsibilities.

The question of administration goes hand in hand with that of organisation, for unless there is proper organisation there cannot be proper administration. There should be a single mind in control from which all plans and authority should start; there should be delegated authority in conformity with the branches of organisation; the recognition of subdivisions of authority, loyally carried out; the determination of a general scheme for its attainment, and the exercise of constant and frequent inspection. The necessity of areas of discretion is consequent upon the fact that unforeseen conditions and circumstances incident to the work in hand are constantly arising in the various branches of work, and must be dealt with without avoidable reference to the administrative head.

The methods of carrying out the various parts of an ordinary task should be left as far as possible in the hands of the head of the department concerned. Superior officers should be left to control as many details as they can safely accomplish, but any undue interference with the responsibility assigned to subordinates is calculated to upset the general effectiveness of the system employed. With subordinates they should be fully alive to the fact and realise that they are being held responsible for results, and that they are free to get the best results out of the particular branch under their control; this should give them an interest in their work, and engender loyalty to their chief, factors which go a long way towards the successful working of all administrations.

Administration must be governed by rules and regulations which are both important and unavoidable, but they should be of such a nature as not to hamper the freedom of the subordinate too closely. The duty of inspection, which is a most important one in all matters of administration, should not be carried out with any idea of being antagonistic to fellow officials or workmen, but should be exercised more in the nature of finding out efficiency and methods and introducing improvements rather than constantly on the look-out for wrongdoing.

Probably one of the most difficult subjects which will have to be dealt with when war is over, is the

RELATIONSHIP BETWEEN EMPLOYERS AND EMPLOYED,

the most essential condition for the progress of industry is peace and mutual goodwill between them. This question has not affected the staffs of men engaged by local authorities under engineers and surveyors to a very large extent at present, but there is no doubt that after the war municipal labour will and should take its proper place amongst the organised labour of the kingdom.

The present condition of labour owing to the war is abnormal, and owing to the high rate of wages paid to both skilled and unskilled labour, together with the large amount of female labour employed, will form one of the most difficult problems to solve.

Strikes or industrial war put a stop to successful industry and nullifies schemes for development. At the present time there is talk of all sorts of schemes for promoting industrial activity and making good deficiencies revealed by the war, but, after all, these ideas will be brought to naught unless we can prevent

industrial strife. This matter does not seem to engage the attention of legislators, employers of labour, and the public in the way it should. The period immediately following on the cessation of war will be a very critical one for the future of industries in general, and if labour ceases its activity in large bodies, opportunities will be lost of acquiring industries and which would again be driven into the hands of workmen and capitalists of other countries.

In order to prevent such industrial strife very great forbearance will be required both from the trades unions and employers; it is natural that the employee should to a large extent wish to participate in the prosperity of the employer, and he of course looks for his part of this prosperity in higher wages, and it ought not to be a difficult matter to form arbitration boards to adjust differences and means to compel both sides to accept such awards. The matter, however, of dealing with labour and production after the war will be one of the most difficult and thorny problems confronting Parliament; and only bold departures from previous methods and rules, undertaken in a new spirit and with great resolution, can prevent strife in some industries, which would have the effect of paralysing others.

This war has shown what women can do in the field of labour, and there will be no doubt a vast amount of female labour retained permanently. The brains of very many women are quite as good and capable of development as those of many men; and in the more democratic times before us we no doubt shall see women take a different status in life from that which was considered proper before the war; whether to the advantage of the race and mankind in general can only be determined by time, and it remains to be seen whether women in authority will develop the same amount of ballast and tact as generally is supposed to be among the principal attributes of a man in a similar position.

This brings me to another point affecting the staffs of large municipalities in particular, and to all public authorities in general; it is the employment of

METHODS THAT MAKE GOOD WORKERS.

The effect of a reasonable selection and careful supervision of the health of municipal employees is practically ignored in this country. The conditions will vary in different localities, but there is every reason for taking care of the workmen's health, as it is of very great advantage to employer and employee alike.

It was a few years ago a very common practice for many local authorities to take on men who had spent their best working days in service of private firms; often these men were not in good health, consequently inefficiency of work and loss of time and disorganisation of services owing to periods of sickness were the result.

With municipal work, employees should be selected with care, and should be young, so as to get a life-long service as far as is possible; they should be physically fit and medically certified as being reasonably sound; they should be allowed sick pay upon a reasonable scale, subject to the production of a doctor's certificate, and should not be discharged without the justice of the discharge being inquired into and certified by the engineer or surveyor.

THE HOUSING OF THE PEOPLE

will have to be taken in hand with a bold and unstinting resolve; very large sums of money will be required for the purpose, and steps should be taken to induce the Local Government Board to give to local authorities some simple and expedient means of launching preliminary "Town Planning Schemes." With the present machinery and formalities it takes three years and upwards to get a scheme through and into working order. Great care would, of course, be necessary in dealing with any preliminary scheme, so that complications did not arise in the carrying out of the complete scheme.

The idea of standardising cottages and buildings in connection with town planning schemes has been largely advocated, but I hope this idea will not be overdone, as one can imagine nothing much more monotonous than a number of buildings of the same plan and elevation; and it is perhaps advisable that in all large schemes an architect of repute should be associated with the engineer and surveyor in its design, in order that true artistic taste may be incorporated, an attribute not too often found developed in the engineer to any marked extent.

In this respect it should be borne in mind that buildings should be erected of a substantial nature; town planning and building should be made a lasting monument to the present generation; there should be nothing of the jerry builder description allowed, and in this respect the danger of standardisation is to be deprecated.

It has been suggested by some architects that a relaxation of, or alteration to, building by-laws should be made, in order to make it easier for cheaper buildings to be erected; but most of the ideas which have been suggested in this respect, if allowed or carried out, would result in ruinous structures not many years after the buildings had been erected. Much of the trouble met with in most of our towns, of bad drainage and dilapidated buildings, is due to the want of by-laws in early days and the defective way in which they have been enforced from time to time. They should be judiciously enforced, making due allowance for alterations in methods of construction and the class of material employed, but bearing in mind that the by-laws constitute the minimum of requirements.

It is absolutely essential in carrying out the proper spirit of

TOWN PLANNING

that everything connected with the scheme should be of a permanent and lasting nature, otherwise that which was intended to be a thing of beauty and joy would only eventually become tawdry, dilapidated and commonplace.

The true idea of town planning goes a long way beyond simply providing open spaces, so many houses to the acre, wide roads, and so forth; it should aim at permanency, beauty (and a plain thing may be beautiful), and a general harmony of nature and utility.

The advice of a landscape gardener should not be ignored; it is not sufficient to simply plant trees at the side of a road, or to have wide grass verges between the road and sidewalks; trees and shrubs suitable for the locality and position should be chosen; and where turf is used, it should be of such a nature that after a few years it would not consist principally of plantains and dandelions.

Municipalities should bear in mind that in town planning, as in most other municipal enterprises, to do a thing on the cheap is always much more costly in the long run than by doing the thing well at first; the latter method gives satisfaction as soon as it is done, and the original cost is not borne in mind very long, but the constant repair and upkeep of a thing badly done is a reminder to the authority and a source of worry to the engineer.

There is now, and has been for some time past, a great tendency in many towns to convert large houses into flats; in the south of England there is a great demand for them, brought about largely by the domestic servant problem and the tendency of people to get rid of the expense, anxiety, and trouble of a house.

There is great difficulty in dealing with their conversion under the ordinary by-laws, as in most cases there is little or no structural alteration to the premises. These conversions, so long as they generally comply with sanitary conditions, ought not to be seriously opposed or objected to by local authorities; flats are, generally speaking, much to be preferred to the ordinary tenement house containing a number of lodgers.

I have usually found that architects and builders will carry out reasonable suggestions if approached in a proper manner, without having by-laws in force which are applicable or touch the question. Flats, moreover, enable people of smaller means to live in good residential districts who could not afford to rent a big house, a large part of which they do not want. I have experienced no difficulty in obtaining notices and plans for the conversion of premises into flats where the building by-laws do not apply, and they are kept for purposes of record if for nothing else.

From a rating point of view, it is better to have one or two flats let than having a whole building empty, and not bringing in rates, if existing as one house.

Much literature has been written and a great deal of discussion has taken place during the last ten years, as to the

IMPROVEMENT OF HIGHWAYS.

There is no doubt that a most remarkable improvement in the condition of road surfaces generally throughout the country has taken place.

Before the war, in some districts in the South of England they appeared almost perfect; but many of these roads have been badly cut up by the heavy traction engine and military motor traffic.

Much of the improvement in road surfaces has been

brought about by the use of tar and tar compounds; and there are few road authorities in the kingdom which have not organised their road making so as to embrace the surface treatment of their roads. There are many articles on the market for the treatment of road surfaces, but I find that distilled tar (No. 2 grade), if applied in a proper manner and under suitable climatic conditions, gives extremely good results, especially where the road traffic is not particularly heavy.

Road construction is, after all, more or less a matter of money; some county councils are able to spend such sums on making and resurfacing the roads in their districts as are out of the question in the case of small boroughs and districts of small rateable value; and in the case of old boroughs, most of the roads in the first instance have been constructed either entirely without or with very indifferent foundations; old gas and water mains exist, and the roads are frequently broken up for repairs to these mains. These causes have to be taken into account in the cost of upkeep, and operate against the making and maintenance of good road surfaces.

In the South Coast towns road metal has been almost unobtainable for the last two years; railway companies refuse to carry it except in small quantities, and for long periods have refused carriage altogether, so that in the case of older towns road repairs have been much neglected, and had it not been for the general use of tar spraying the roads must have gone to pieces. No doubt after the war is over very large quantities of materials will be required, and large sums will have to be expended in putting roads all over the country into a satisfactory state of repair; the greater difficulty will be, however, for local authorities to find the money without material increase of rates.

I should like to refer to the subject of design and construction of

REINFORCED CONCRETE STRUCTURES

before closing my address; it is a matter which I have tried to study and master for the last four or five years, but I have come to the conclusion that this subject is one which is of such a special nature that the design and calculation of the strains of such structures, except those of a simple character, should be left to men who are making, and have made, the subject their special study.

The calculations involved in ascertaining the stresses and strains in a large and complicated structure require the application of higher mathematics to a degree that the general body of municipal engineers are not capable of giving; but I certainly am of opinion that they should be in the position of following those calculations through after they have been made by the expert, but even this requires a very sound knowledge of mathematics.

The carrying of such designs into execution should only be entrusted to firms of repute and who have had experience in such constructions. One hears a deal of successfully completed structures but not often of the many which are failures through either faulty calculations or construction, or due to both.

One has heard of the obstacles placed in the way of municipal engineers by the Local Government Board in the early days of reinforced concrete, and I think they were quite justified in their action.

There were few municipal engineers at that time who had had the time and opportunity of closely studying the problems and pitfalls which this subject involves. There probably is no subject dealt with by the engineer requiring greater application of the use of mathematics, and certainly none requiring greater care and responsibility from chief and subordinates than the carrying out of more or less complicated reinforced concrete structures.

This war is changing, and will change, most things; it will probably broaden the views of most people, largely alter customs, mode of living, the pursuit of commerce, and, we hope, the standard of education and the subjects taught.

If this country is to take the commercial position it should,

INDUSTRIAL RESEARCH AND SCIENTIFIC EDUCATION

must go hand in hand. Our national education, in my opinion, is to a large extent run on wrong lines; children have a smattering of this subject and that, and in most cases know very little when they leave school that will be of use in after life. Of course, there are many exceptions; and in a large proportion of these cases the boy or girl would probably come to the top in any case; but even with clever people there is often a want of the knowledge of common facts.

Some better system will have to be found for the evening school; most children who have been brought up in elementary schools take little or no interest after leaving at the age of fourteen, and at present there is little inducement for them to do so, after being at work all day; picture palaces and lounging about are their principal pleasures; there is not even a desire to train themselves in physical development; and, again, one has only to refer to the war to see what can and has been done in the way of development of body when systematic training is resorted to. Thousands of weedy-looking youths by proper training have been made into strong, robust, healthy men.

It is equally possible to train the mind to a similar robust state, and every boy and girl should be compelled to attend classes up to the age of eighteen; the subjects should be so arranged and taught as to make them interesting and attractive.

Science will have to take a much more prominent place in the education of all people if commercial supremacy is to be maintained; dead languages abandoned to all except those who have leisure to learn them, and certain modern languages generally taught; mathematics and applied sciences may even be made attractive and interesting, if properly taught; but much depends on the teaching. It is one thing to have the knowledge, but quite another to impart that knowledge to others in such a way that the subjects may be fully understood.

It is a most important matter that parents should by the time a boy is fourteen years of age make up their minds what calling in life he is most suited for, and then give him that training and education specially required for such calling.

A boy is often put into the engineering profession because he has an aptitude for drawing; probably that boy will never get beyond the position of a draughtsman, and there are innumerable similar cases in all professions. A boy will often make a successful commercial man and yet be no good in a profession, and it behoves all municipal engineers to be very careful in taking pupils if they are to be a credit to themselves and to the engineer to whom they are articled.

Scientific knowledge and practice must run togther; the one is not much good without the other; they must both be progressive; methods of construction rapidly change, involving fresh scientific knowledge, and the successful engineer has consequently to be always learning something new; and it is, in my opinion, this fact that makes this profession

THE MOST ATTRACTIVE AND FASCINATING CALLING

of all professions. One has only to note the pride, vigour and liveliness of its members when carrying out some important scheme, as compared with the humdrum monotony of routine work, to be convinced of this.

It is highly desirable, if it can be obtained, that the engineer should have some mechanical training. He is called upon frequently to carry out schemes where mechanical power of one kind or another is used, and he should know something of the design and construction of the plant to be installed. Most municipal engineers have control of mechanical plants and machines, and to be in a position to know what is wrong and how it should be put right is a distinct asset to the municipality, and a control over those actually in charge of such plants. I have found this knowledge of enormous benefit to myself; it has saved the Hastings Corporation money, and enabled me to carry out work by administration which I could not have done without it.

Organisation should be one of the chief aims and forces of our institution, for without it we shall never be able to present a bold front, and achieve our objects of fixity of tenure of office and superannuation. We should all individually and collectively work for an ultimate object, sinking personal opinions and differences when it is necessary for the good interests of the institution.

I am of opinion that the institution will never get that full recognition it deserves from Parliament and the Local Government Board until it can show that it represents the whole body of municipal engineers and surveyors throughout the kingdom; and I should be glad to see negotiations set on foot with a view to amalgamation of the two bodies representing municipal surveyors. The younger institution has a membership of about 800, and is distinctly progressive, and, as far as I have been able to judge, well organised.

I have reason for thinking that the

TIME IS RIPE FOR AMALGAMATION,

and that the obstacles and difficulties to be overcome

are not really so formidable as many members might suppose; and I am quite sure if approached and dealt with in a give-and-take and amicable spirit would not be insurmountable. The fusion of other institutions having similar aims and objects to one another has taken place within the last year or two, without very much difficulty, and I feel sure it ought to, and could, be brought about in the case of the two municipal institutions with distinct and great benefits to the members of both.

The Prime Minister's recent speech after resolutions passed at the Labour Party's conferences dealing with labour after the war might well apply to all local government officers. I cannot think that the term Labour Party should be simply applied to those who work with their hands; as the use of automatic machinery becomes more general it will be necessary for "labour" to work more with their heads, and of all the classes of local government and educational officers the municipal engineer and surveyor surely has more responsibility thrown upon him than any other. He is responsible for the spending of large sums of money, and for the success or failure of various schemes, and to a large extent for the healthiness of the town or district.

One only need refer to the recent success achieved in the House of Commons by the National Union of Teachers to see what can be done by organisation and diligent and steady working to achieve an object in view, and although teachers have been recognised apparently as a national asset, they have not certainly any ground for priority of claim over local government officers on grounds of "national importance."

The country has depended upon local government officers very largely in this war, and the response made by municipal engineers and their staffs to the call of national duty, as well as the work being done by those whose age prevents them from field service, deserves recognition in some tangible form at the hands of the Government, and superannuation and some form of security of tenure are surely not too much for the Government to pay for all the work that local government officers have done for the war. In conclusion, I would like to say that what teachers and other professional workers can do, municipal engineers and surveyors can do, if they will throw their whole energies into proper and efficient organisation and be prepared to combine into one body and make the sacrifice of time and the necessary expense to make it effective.

Mr. J. S. Pickering moved a vote of thanks to the president for his address, which, he observed, was appropriate both to the occasion and to the time in which we lived.

Mr. A. D. Greatorex seconded, and the motion was carried.

ANNUAL REPORT OF COUNCIL.

According to the report the roll of the institution now stands at 1,769 as compared with 1,797 last year. The names of 513 members on active service are given, but this is stated to be considerably short of the total number who are serving their country.

The council have continued the rule made at the beginning of the war that each application for remission of subscriptions should be considered on its merits with special reference to the financial position of the applicant, and as a result a number of members have been allowed to discontinue their subscriptions.

The financial position of the institution continues [illegible]. The arrears of subscriptions have risen to £1,001 5s., an increase during the year of £305 5s. 6d. In view of the abnormal circumstances which have thus arisen it has again been thought desirable to increase the reserve against this item. It is noted with satisfaction, however, that many items under the head of expenditure have not increased in proportion to the general rise in prices. On the income side of the account there has been a decrease of £60 16s. 6d. in the amount of subscriptions received from members, and owing to the fall in the number of candidates presenting themselves for examination the amount of fees has been reduced by £72 9s. The institution has increased its investments by £900 by the purchase of £1,000 of Five per Cent. War Loan, 1929-47.

Mr. J. S. Brodie, in moving the adoption of the report, referred with regret to the deaths of Sir Alexander Binnie and Mr. William Harpur, city engineer of Cardiff. Considering the disadvantages under which they were carrying on their work and the enormous depletion of staffs, it was a credit to the members of the institution that seventeen meetings [illegible] during the past year. The number of members who had resigned and been written off and the new members practically balanced each other, but unfortunately there had been in addition deaths of twenty-eight other members. The number of members on active service was something like 30 per cent of the total roll of members. The standardisation of statistics had received careful consideration during the year, and he especially commended the work of Mr. Elford, the chairman, and Mr. Willis on that committee.

Mr. E. Willis, in seconding, said he would like to add to the names mentioned by Mr. Brodie those of Mr. Boulnois and Mr. Dodd for their work on the Standardisation Committee. He appealed to members to use the standardisation forms, as without the co-operation and support of members the committee was practically useless. With regard to superannuation and security of tenure, he said a committee was working under the able presidency of Sir Homewood Crawford to create a strong body of opinion, and if they succeeded in doing this, he believed, in spite of opposition which might arise after the war, it would become an accomplished fact.

The report was adopted.

The discussion of papers commenced in the afternoon, and will be resumed this morning.

(To be continued.)

ORPHAN FUND MEETING.

The customary meeting of subscribers to the Orphan Fund was held yesterday morning.

The report of the Committee of Management stated that the number of subscribers to the fund during the year had been 231, and the amount received £143 15s. 3d., being approximately the same as in the preceding twelve months. The donations, however, exceeded those of 1915 by the sum of £13 17s. 5d., whilst the invested capital yielded a slightly increased revenue of £2 3s. The income thus showed an increase of £15 3s. 2d. beyond that of 1915, whilst the expenditure was reduced by £10 8s. 9d., the nett result being an improved income of £25 11s. 11d. beyond that of the previous year. The number of children wholly or partly dependent upon the grantees of the fund was fifteen.

At the end of the year to which the report referred few replies had been received to the recent communication of Mr. Robson inviting members to assist in enlarging the scope of operations in connection with augmentation of the funds; but the committee suggest that the period chosen for reorganisation was somewhat adverse to speedy and effective consummation of the scheme, which, it was hoped, however, would fructify as time went on. In the meanwhile every endeavour was being made to maintain the fund and to secure adequate income for the present grantees or others that might be forthcoming, whilst the invested funds represented an amount at all times available should any excessive or abnormal claim be made upon the fund by grievous possibilities arising from the war. In appending a list of the subscriptions and donations received during the year 1916 divided among the various districts, the committee take the opportunity of thanking the various subscribers for their generous assistance; but again urge upon the members of the institution generally to take a wider interest in the fund than is now shown by a list of 231 subscribers from the total muster roll of 1,767 members representing the institution.

Mr. T. Cole, the consultant secretary to the institution, read a letter from Mr. O. Claude Robson, the hon. secretary and hon. treasurer to the fund, intimating his inability to attend owing to pressure of work. Mr. Robson said he felt the time had come when greater attention should be given to the fund, and added that he understood there was no difficulty in the work connected with it being undertaken at the institution offices.

Mr. J. S. Brodie said they all regretted Mr. Robson's absence, but his wish to be relieved of office could not be entertained. The necessary clerical work could very well be done at the offices of the institution, but Mr. Robson must remain as honorary secretary and treasurer of the fund. Mr. Brodie, in moving the adoption of the report, observed with satisfaction that the income of the fund was nearly £26 more than in the previous year. Another gratifying feature was that since the appointment of district stewards subscriptions had increased nearly £40.

Mr. H. Percy Boulnois appealed for more subscriptions to make the fund worthy of the institution.

The report was adopted, and Mr. Robson was re-elected.

Institution of Water Engineers.

SUMMER GENERAL MEETING IN LONDON.

The twenty-second summer general meeting of the above institution was held on Friday last at the apartments of the Geological Society, Burlington House, Piccadilly, Mr. F. W. McCullough, the president, in the chair. The attendance included: Messrs. Thomas Booth (Stanford), James Dewhurst (Chelmsford), W. Vaux Graham (London), Henry Preston (Grantham), W. P. Walker (Tewkesbury), F. Storr (Chester), A. W. Oke (Hove), Ashton-Hill (South Staffs), F. J. Dixon (Ashton-under-Lyne), John Ward (Derby), D. Halton Thomson (Portsmouth), A. C. Willcocks (St. Helens), Arthur Valon (Westminster), H. C. Head (Winchester), F. W. Davies (Nottingham), H. Lapworth (Westminster), W. J. E. Binnie (Westminster), William Matthews (Westminster), T. Muir Thomson (Tonbridge), E. A. Lees (Birmingham), T. Molyneux (Stockport), E. J. Silcock (Westminster), Alfred B. E. Blackburn (Sunderland), C. H. Priestley (Cardiff), C. B. Newton (Hull), C. H. Bowser (London), W. W. Whitaker (Croydon), Gilbert Christie (Kilwinning), Samuel Rideal (London), T. R. Smith (Kettering), Dawson Kitchingman (Southampton), William Paterson (London), A. H. Cooper (Farnham), R. B. Rigby (Bury), J. S. Pickering (Cheltenham), W. T. Burgess (London), and Percy Griffith (Westminster), secretary—members, and John Hopkinson (Watford), Salter Carle (London), F. L. Williams (New Barnet), W. Burgur (Melton Mowbray), Charles Clifton (London), and Dr. J. H. Garrett—visitors.

Following the confirmation of the minutes of the twenty-first winter general meetings held in London on December 8, 1916, and of the special general meeting held on January 5, 1917, the secretary announced the names of members elected since the last general meeting, and those present were offered a hearty welcome by the president.

PRESIDENT'S ADDRESS.

The President then said: Although my election to the office of president for a third year is extremely gratifying to me personally as indicating the continued confidence of my colleagues on the council, and of the members generally, it is nevertheless a matter for regret that this unique honour to myself is associated with and due to the prolongation of the titanic struggle in which this Empire, with the bulk of the civilised nations of the world, is at present engaged.

From the statement of accounts members will see that, although the revenue for the year 1916 was £43 less than that of the previous year, the amount of arrears written off was £93 4s. 6d., compared with £5 9s. 6d., and the reserve fund for future arrears was increased by £55 17s., there was, nevertheless, a balance of £73 2s. carried to the accumulated fund. In this connection reference may appropriately be made to the policy adopted by the council of relieving members on active service from the payment of subscriptions. Pending the alteration of the articles of association, the council were only able to adopt the negative action of not applying for subscriptions in such cases, but now that the council have specific authority to remit subscriptions, the relief will be definitely offered according to the circumstances arising in each case. It is worthy of record that in several instances members on active service have voluntarily refused this relief in the interests of their fellow-members, and on behalf of the council and the members generally I desire to express appreciation of their generous action. The membership roll at the end of 1916 stood at 412—a decrease of thirteen as compared with 1915. The number of members of all classes reported as on active service abroad or national service at home is now sixty-four. The losses during the year 1916 were due almost exclusively to the war, and the small number of new members elected was also due to the same cause, but the nett loss of 3 per cent is probably as small as that experienced by any other institution of the kind.

The next business was the presentation of a report of Messrs. Wm. Matthews, F. J. Bancroft and P. H. Palmer, the institution delegates on the special subcommittee of the Engineering Standards Committee dealing with the subject of the

STANDARDISATION OF CAST-IRON PIPES,

which is reproduced on another page of this issue.

The President said he was sure the members, as did the council at their meeting, would like to express their thanks to Mr. Matthews and his sub-committee for the great amount of labour they had expended in standardising cast-iron pipes for water supply. The short report which Mr. Matthews had read gave very litt'e idea of the tremendous amount of work done by the sub-committee. He (the president) had seen a rough draft of the specification, and it would be printed in due course, and the secretary had instructions from the council to send out in the next circular an announcement to the effect that the specification was available, and indicating where it could be purchased. He moved the best thanks of the meeting to Mr. Matthews and his sub-committee for the great amount of work they had put into this question.

Mr. C. H. Bowser (London) said that as one of the members of the committee representing the pipe founders he would like to second the motion, and to say how much they were indebted to Mr. Matthews and his colleagues for their assistance in getting this difficult work carried through. They would have noticed that in the report it was stated it was discovered that there were very great differences of opinion existing even amongst the most eminent engineers. He was sure the founders would be pleased to know that such a record of the work of standardising cast-iron pipes was to be put into the transactions of the institution. The establishment of a standard would somewhat change the character of the conditions under which cast-iron pipes had hitherto been manufactured, and the tendency would be to perfect the plant and works for the manufacture of standard products, and it would be extremely difficult to get work which was specially specified. The founders were glad that an opportunity for revising the specifications would arise yearly as conditions changed, and there were some features of the specification which they could have wished would have been somewhat different. Experience would show how the specification could be improved, and how the manufacture could be advanced in accordance with the best practice prevailing here and elsewhere.

The resolution was carried.

AWARD OF PREMIUMS.

The President next presented the following premiums:—

The President's Premium value £10 to Mr. D. Halton-Thomson, M.A. (Cantab), Asso.M.Inst.C.E., for his paper on "Alignment Diagram Applied to the Flow of Water in Uniform and Compound Mains"; an Institution Premium value £7 to Mr. W. J. E. Binnie, B.A. (Cantab), M.Inst.C.E., for his paper describing the Cross-hill Service Reservoir constructed for the Birkenhead Corporation; and an Institution Premium value £5 to Mr. Charles Clifton, F.A.S.I., for his paper entitled "The Rating of Waterworks." In making the presentation to Mr. Binnie, Mr. McCullough said he would take the opportunity of expressing his personal regrets and the sympathy of the members of the institution at the loss of his father.

(To be continued.)

Municipal Coal Distribution.—At the last meeting of Huddersfield Town Council a scheme for the supply of coal to the poor was outlined by the mayor (Alderman Jessop), who stated that the matter was in the hands of a committee, consisting of the mayor or his deputy, the chief constable or his deputy, two coal merchants, one representative of each railway company, one representative of each canal company serving the district, and a secretary. The committee was appointed to see that the poorer classes obtained coal without undue hardship, and was working in the interests of the poorer classes. There was not much fear of their being neglected in the matter. He understood that the coal was to be sold from depots at prices which would, he hoped, be fixed by the Controller, and it was possible that they might take advantage of an extension of the present method of coal haulage on the tramways so as to get the coal easily to the tops of the surrounding hills, where there had been much inconvenience during the past few winters.

Modern Sewage Purification Works Design, Construction, and Management.*

By CHARLES TERRY, Works Manager, Canterbury.

In preparing this paper upon the subject before us, I wish it to be clearly understood that it is not my intention to assume the position of dictator or critic, neither do I wish to advance a new theory, or attempt to lay down any dogmatic rules with the idea that they may be applied to the design of every modern sewage works. Past experience has convinced us that to attempt such a proposition must end in disappointment and failure. The varying circumstances connected with each locality render it impossible to fix any definite standard or plan of operations that could with any degree of safety be adopted by the engineers when called upon to make a design for a new works upon modern principles.

While agreeing that this is so, we as an Association of Managers should be prepared to acknowledge the wonderful advance that has been made in the direction of solving the great problems with which we are so deeply interested since the time the association has been in existence, and should be proud also to acknowledge that much of the advance in this direction has been due to men who, in the face of great difficulties and assailed with much adverse criticism, have gone forward and by hard work and persistent determination have brought this particular branch of sanitary science to such a position as to at least make it possible, provided certain laws are observed, to purify sewage to almost any extent, and by their labour, loyally seconded by members of this association, have raised the duty of the works manager from that of rule of thumb to that of scientific administration.

Having thus given the negative side of my intentions, I pass on to the positive, in connection with the first division of the subject, viz.,

DESIGN.

The very fact of this great advance, and the increasing number of modern works being designed, largely if not exclusively upon the generally accepted principles known as the bacterial process, make it necessary, in the author's opinion, to emphasise a few details which from a manager's point of view are essential in the design of sewage purification works, and which I fear, in view of the success already attained, are calculated to be, if not altogether overlooked maybe by some engineers, relegated as secondary in importance and too old-fashioned to be given the attention it deserved. Therefore it is in order that all up-to-date works shall have a chance of successful working that I venture to mention a few details which, if neglected, will in the author's opinion render it difficult if not absolutely impossible so to administer the modern works to the best advantage. These details I propose to mention in the order in which they occur.

In the opinion of the author, in all cases the level of the water in the sump or channels should be at such a level as to allow at all times a free discharge, the reason being, in the first place, this will prevent the deposit of grit in the sewer, and, secondly—from a manager's point of view this is of great importance the prevention of the crude sewage from undergoing that objectionable and I trust out-of-date process known as septic action, the effect of which renders the liquefied sewage far more difficult to treat by any of the known processes. Having by this means prevented the accumulation of grit in the sewer, provision should be made as soon as possible to remove it. This can be readily done by forming a small catchpit in the sump or channel, to which an elevator should be connected; if this is mechanically operated and kept in continual motion it will be found effectually to prevent any accumulation of grit and will give little trouble.

It is not necessary to pump the crude sewage into the tanks, as access is absolutely necessary. Many screens used have of late years been of very elaborate construction, and although unnecessary in many cases. In a high level tank within easy reach from ground level there is nothing which gives so little trouble as a simple perforated plate, with holes large enough to prevent it from being choked, or anything calculated to injure the pump, from passing, but wide enough to allow all paper and excrement to pass through freely. If found practicable to use such a screen, it can be kept clean by the use of a rake by hand, but if at a low level it will be necessary to provide a cleaning rake, mechanically operated, and again kept in continual motion.

Pumps.—The great variety of pumps used and their efficiency being so well known renders it unnecessary for me to detain you upon that particular detail. But I should like to say one word as to the power used to operate them. I am well aware that this has very largely to be governed by the locality in which the works are situated. But if in such a position that will enable the engineer to obtain current direct from the local mains, and providing it can be had at a reasonable figure, I am convinced there is nothing to compare with electricity, either for convenience, efficiency, or economy, providing always the pumps are arranged upon the step-up principle, by which I mean one pump capable of lifting up to half the maximum hourly flow and one from half to the maximum.

By adopting this plan at the works of which I have charge a nett saving of £2 per week was effected on the night flow only. The reason I think is obvious, that a pump electrically driven is working at its highest point of efficiency when under full load. This principle can be applied either with a small or a large hourly flow. I think I am justified in asserting that practically all engineers, and certainly a large majority of managers, agree that the final purification of sewage, if not at present, in the very near future, will be accomplished by the bacterial process, either by the use of contact beds or percolating filters, being by experience assured that under proper conditions and with properly designed works this can be done in such a manner as will reflect the greatest credit to the engineer and manager.

It is with one of the conditions I now wish to engage your consideration, conscious at the outset that I shall have to part ways with many who to this point have been in agreement with what I have written. However, if we differ, I feel sure we shall do so prompted with but one desire, viz., the general good of the object we have in view.

One rule or condition laid down by all experts is that if a contact bed or filter is to work efficiently for any length of time it is absolutely necessary that the maximum quantity of suspended solids must be extracted previous to its final application to the filter or bed. It has been given by many experts that no more than ten parts per 100,000 of suspended solids should be put upon such filters, or trouble will be the obvious result. But with the exact quantity we will not quarrel. What concerns us as managers is the principle, which after all is but common sense, and while we are glad to acknowledge that the difficulties of the final purification of the liquid sewage have to a large measure been overcome, we as managers are convinced that the difficulty connected with our old friend Sludge is increased to a considerable extent. It is with the object of keeping this side of the question before those who are called upon to design new works that I venture to suggest that they, assisted by the members of this association, should give of their best to try and bring about as satisfactory a solution in this connection as has been done with the final treatment of the liquid sewage.

To accomplish this, I beg to suggest that the one idea in the design of tanks should be not to change or destroy, but to arrest the solids, letting the amount of solid matter arrested be to some degree a visible evidence of the purification effected.

This, in the opinion of the author, can be readily done without the aid of expensive, complicated tanks, although some of these are doing good work. But during twenty-five years' experience with a fairly strong domestic sewage, I have found that if the tanks are so arranged that the direction of the flow is changed in each tank, it will be found that there will be no difficulty in getting the solids to fall to the floor, and the maximum quantity of solids will be arrested in the minimum amount of time. Such tanks being provided with good, but simple means of

* Paper read at the annual meeting of the Association of Managers of Sewage Disposal Works.

cleansing, will be found to operate efficiently and give the least amount of trouble to the manager or his assistants. Having thus arrested this objectionable but necessary evil, it follows that some means of disposing of it is necessary. This brings us to a subject which I submit has not had the consideration which is due, but one which demands thoughtful attention before our modern works can be regarded as satisfactory. I therefore submit that the expert, be he engineer or manager, who can design a plant which can be relied upon at all seasons to render the sludge as collected from the tanks capable of being transported, either by road or rail, will have accomplished a task which, added to the improvements already effected, will have done much toward the complete solution of this difficult problem, in the solution of which we are all more or less engaged. I am aware that chemists tell us there is little or no manurial value in this product, but, as the proof of the pudding is in the eating, so the proof of the value of sludge in its natural state is manifestly proved in the satisfactory crops resulting from the use of it. Therefore I have long since come to the conclusion that the proper place for the solid matter collected at the sewage works is "the land." And at such times as this, and in view of the requirements of the future, it behoves us to spare no effort to prevent the waste of anything that may by the help of nature enrich the soil, from which it is necessary to obtain every ounce of food possible.

Filters.—Little can be said as to the design of filters or contact beds; each case must be determined by the particular circumstances surrounding the position of the works, but again I ask all engineers who are putting down works upon the bacterial principle to make liberal provision for humus, which is a glorified name for sludge, for be assured that this humus or sludge will accumulate in proportion as the filters do their work.

CONSTRUCTION.

Upon this aspect of the subject I do not think I need detain you for long, there being comparatively few points upon which we should be found to differ. But I suggest that it is very noticeable that at some works, constructed upon the modern principle, nothing has been spared to render the construction of buildings, tanks, filters, &c., not only substantial, but in some cases extravagance is apparent in almost everything. I am afraid in such cases the object in view has been percentage rather than efficiency, and obviously without regard to the source from which the finance emanated, viz., the ratepayer.

In the construction of new works it is the opinion of the author that, where practicable, it will be found an advantage to carry out such work by direct labour under the supervision of the engineer, the manager acting as his clerk of works. In making this statement it is not my intention to suggest anything detrimental to contractors, many of whom take a delight in carrying out the work entrusted to them in a very satisfactory manner, but I feel convinced by adopting the suggestion of direct labour the manager becomes intimately acquainted with many hidden details which would otherwise escape his notice. Again, oftentimes the engineer finds it to his advantage to use material which would otherwise have to be disposed of at a very low price, but which if used would be worth as much as the best material.

In this connection I venture to suggest that with proper care and judgment nearly the whole structural part of the works may be substantially, efficiently and economically constructed by the use of the fine ash screened from the clinkers used for filling the filters, and if used in proper proportions with Portland cement will give every satisfaction as regards appearance and stability.

In conjunction with the city engineer, the author has recently erected eleven 80-ft. diameter percolating filters, the floors and retaining walls of which have been constructed with this material, the results of which are very satisfactory indeed. The cost, including all necessary timber, &c., for forming walls, was 15s. per yard cube.

It may be rightly argued that retaining walls are not necessary, and that large clinkers or stone blocks can be used, as is the case in many works. With that I quite agree, but in the case before us it was impossible to obtain large clinkers or other large material in the district, therefore by using the fine ash screened from the clinkers, with cement in the proportion of 5 to 1, a good and substantial job was made, which I venture to say did not cost more than the dry building of large material had these been used.

Another rather expensive item generally met with in constructing contact or percolating filters is that of drainage floor tiles. Again the fine ash can be brought into good use in providing for this. The author has designed and registered a floor tile for this purpose which he is confident will in every respect answer as well as any one of the most expensive glazed tiles upon the market to-day, and they have the advantage in most cases of being much cheaper. The cost allowing for the use of clean sand and cement is at the rate of 2s. per square yard. One great advantage of using tiles such as these is that, being manufactured on the site, there is a considerable saving of haulage by road and rail. By the use of this tile at the works already mentioned the author was enabled to effect a saving on this item alone of £300. In addition there is the advantage of a new industry in connection with the destructor works, by which means much which is now considered waste material can be turned into commercial value.

In the construction of manholes, valve pits, tank walls and floors I am convinced nothing that can be used for this purpose will give better results and be more easily worked; any good, intelligent workman with a little practice can do all that is needed to effect a good job.

This brings me to my last division, viz.:—

MANAGEMENT.

This being the last is by no means the least item of importance in connection with our subject. For although we may, and doubtless shall, differ in our opinions regarding both the design and construction, I am convinced we shall all agree that, no matter how perfect the design and generous the provision made for the sludge disposal or filtration of effluent, no matter how elaborate and substantial the construction, if badly and carelessly managed, failure is bound to be the result. I cannot hope to be able to teach my hearers, many of whom have spent many years of their life in this particular branch of sanitary work, who have proved themselves efficient and valuable officers. The works of which they have charge are a credit to the councils by whom they are engaged, owing to the faithful and conscientious manner with which they have discharged their duties.

I am afraid that there is a possibility of the services of this particular officer often being overlooked by the powers that be; not because the authority wishes to slight him, but more often because of a want of real knowledge on the part of the committee or council as to the importance of the work which the manager is called upon to do. That is the only reason which has brought some of our members in the past to seek by some means to raise the status of the managers, and prevail upon the authorities by whom they are engaged to see to it that they have a chance, with other officials, of receiving the appreciation of the authority, which is due to them by virtue of the office they fill. To bring this about in a way which the author firmly believes would be acceptable to all concerned, I suggest that the man appointed to take charge of what I confidently assert to be one of the most delicate pieces of machinery, upon proving his qualifications, should be appointed by and be responsible to the committee or council, and should have given him the absolute and complete control of every department of the works. By this means he would be brought in touch with his employers from time to time, who would be bound to acknowledge him in his true position, viz., an official of the corporation or board.

I should have gone into greater detail respecting the management, but time would not permit, but those who would like some useful hints upon this subject, every one of which is endorsed by the author, I should advise you to obtain, and having obtained, read, study and digest, the excellent little book by Mr. W. C. Easdale, a member, on the "Practical Management of Sewage Works."

Joint Water Boards.—The establishment of a joint water board for Cardiff, Newport and Merthyr was proposed at a meeting of Cardiff Waterworks Committee last week. Alderman Illtyd Thomas said the suggestion was considered impracticable a long time ago. Mr. C. H. Priestley, the water engineer, said Sheffield, Leicester, and Derby, combining in such a scheme, were further apart than Cardiff, Newport, and Merthyr. Mr. Blower said each of the three towns was now constructing a reservoir, and he thought they might combine in one additional reservoir. It was understood that the chairman would take an early opportunity to see and consult the chairman of the Newport and Merthyr authorities.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Was it not a very important pronouncement of the president of the Institution of Municipal and County Engineers yesterday that "the time is ripe for amalgamation with the Institution of Municipal Engineers, and shall we not all agree that unity is strength, and that until the whole of the municipal surveyors and engineers of the United Kingdom combine into one large and powerful institution many of the grievances under which they now suffer will never be removed? Is it not to be hoped that the councils of both institutions will do all that they possibly can to bring about an amalgamation?

* * * *

When will the Road Stone Quarries Control Committee get to work? Did they not instruct quarry owners to "carry on" as usual until June 15th? What has happened since that date? Is it not a fact that one of the chief difficulties in connection with the distribution of road metal or stone to local authorities is the want of labour at the quarries, and the problem of railway carriage and sea transport? Are there not many local authorities only too willing to spend money on the repair of their roads if they could only obtain the material, and knew where to get it?

* * * *

Has not the work of the London "Safety First" Council been very practical and useful since this self-constituted body came into existence, and has not the Street Dangers Committee of the council shown a peculiarly intelligent grasp of the situation? Has not their action with regard to the position of street lamps, and of refuges and other matters with which they have dealt, been of the greatest service; and is it not to be hoped that the council and their committees will continue their good work even after the war is over?

* * * *

What will the "Safety First" Council do if they are unable to induce the Chief Commissioner of the Metropolitan Police to accept the suggestion that pedestrians should keep to the left instead of to the right? Will they induce a number of persons to keep persistently to the left, or could there be formed a "Keep to the Left League"? Are there any suggestions which readers of these "Things" would like to make on the position?

* * * *

Is not a useful object-lesson provided by the recent experience of an American town, where a storm-water sewer, which was supposed to be choked with tar from the local gasworks, was found to have sunk no less than 4 ft. 9 in. out of the vertical, thus forming a bad syphon with leaky joints? Is it not interesting also to find that the cause of failure was due to the washing away of the subsoil by leakage from the joints of the pipes, which were purposely laid dry-jointed in order to drain the subsoil? Is it at all surprising to learn that the pipes were relaid "with joints caulked with oakum and filled with cement mortar"?

* * * *

Is the plumber going to become as extinct as the dodo? Do we not hear on all sides of the great difficulty that exists in procuring the services of this much-abused man (in peace time), and shall we not be inclined to withdraw all the unkind remarks we used to shower on him when we can find him and require some simple but essential repair to our sanitary arrangements to be executed at once?

* * * *

Widely is the most important at the present juncture—food or coal? Will it be better to denude the roads of labour in order to have more on the farms, or to keep up our roads to a proper standard? Is not this one of the problems which the war has brought before us, and which will require a prompt solution?

Census of Steam Lorries.—The Minister of Munitions orders that all persons (other than railway companies) owning or having in their possession or under their control any steam driven haulage lorries or trailers in Great Britain shall within fourteen days from Tuesday last send to the Deputy Director General of Railway Material Licences, Ministry of Munitions, Whitehall-place, London, S.W. 1, returns containing particulars with regard to such steam lorries and trailers.

CORRESPONDENCE.

Εἷς ἀνὴρ οὐ πάντ' ὁρᾷ

(One man does not see everything.)
—Euripides.

RAINFALL.

To the Editor of The Surveyor.

Sir, I forward herewith a reproduction of a rainfall diagram taken in Sheffield on Wednesday last, which may be of interest.

Each vertical upward line represents ½ in. of rainfall, and a careful analysis of the chart will show that in Sheffield, on the 20th inst., there was a rainfall of ·72, or approximately ¾ in. in a quarter of an hour.

Four of these self-registering gauges have been at work in different parts of the city, but I have never seen a chart anything like this.

Although the city is very hilly, there was scarcely any flooding, and very little damage was done, most of the important roads which are not paved being either tar-macadamised or tar-sprayed.—Yours, &c.,

W. J. Hadfield,

Town Hall, Sheffield,
June 25, 1917.

[The diagram referred to by Mr. Hadfield does not, unfortunately, admit of satisfactory reproduction.—Ed. Surveyor.]

COVERNMENT AND CONSULTING ENGINEERS.

To the Editor of The Surveyor.

Sir,—The paragraph in last week's Surveyor referring to Mr. H. T. Rolfe's speech at the annual meeting of the Association of Consulting Engineers raises a very pertinent question. Why, indeed, does not the Government make more use of the brains of the many consulting engineers anxious to serve their country, but whose services, from some unexplained cause, have been refused?

In my own case I have made eleven offers to different Government Departments, and have received eleven negative replies, and my experience in the profession extends over a period of thirty years.—Yours, &c.,

Consulting Engineer.

Victoria-street, S.W. 1.
June 25, 1917.

THE NEED FOR MUNICIPAL HOUSING.

A MEDICAL OFFICER'S VIEWS.

In mentioning in the course of his annual report that in many places in the town the water-closet accommodation is very inadequate and unsatisfactory, Dr. R. H. Weight, acting medical officer of health of Trowbridge, says: "It seems to be impossible to do much towards improvement during the continuance of the war. I believe the condition of the houses of the weekly wage-earning classes will never be generally satisfactory while private property. I am convinced that houses of a less annual rental of £15 in the town and £10 in the country should be owned and administered by the local authority. The houses should be standardised as to appointments and governed by by-laws. The sanitary conditions could then be made, and kept, as they should be. The man with four or five children would have no difficulty in obtaining house accommodation. The great influence of house environment upon the health, morals, and mental outlook of the occupants is not fully appreciated."

Works Departments.—Recent minutes of a sub-committee of the Huddersfield General Purposes Committee showed that the town clerk had obtained information from other towns in reference to the establishment of a works department, but the committee did not consider the present time an opportune one for the establishment of the department, although they had appointed a small committee to consider the desirability of building one block of houses by the borough engineer, in conjunction with the Operatives' Federation of Building Trades Unions, as an experiment. The full General Purposes Committee had confirmed these minutes, with the exception of the appointment of the sub-committee.

STRAKER-SQUIRE VEHICLES.

The accompanying view, although at first sight representing a scene of municipal and sanitary work in a typical London back street, would hardly lead one to believe that the Straker-Squire 5-tonner in question is only getting its hand in for the much harder work it is really intended for. The machine was constructed with a special Ruston hand-tipping body for use in France, for some very stern work of warlike nature behind the lines. The vehicle is one of a fleet which have preceded it, used for mending roads, filling up shell holes, and generally "paving the way" for a speedy return to its natural mechanical mission in life.

Straker-Squire 5-ton Motor Wagon with Hand-tipping Body.

SUPPLY OF MOTOR SWEEPING MACHINES.

THE ISSUE OF PRIORITY CERTIFICATES.

In the House of Commons on Monday the Minister of Munitions was asked whether an application was made by the metropolitan borough of Islington to the priority branch of the Ministry of Munitions for a certificate allowing them to purchase a motor sweeping machine from a firm in York-road, Islington, which is prepared to supply it; whether this application was refused; whether such applications had been granted to other metropolitan boroughs; and, having regard to the difficulty of procuring horses and the price of fodder, and the urgent need for curtailing expenses, he was prepared to reconsider this decision.

The Minister of Munitions (Dr. Addison): It is the case that during the past twelve months a few motor sweeping machines were from time to time supplied to borough councils, but the necessity for the provision of spare parts for motor transport has required the curtailment of permits for motor sweeping machines. The particular application of the Islington Borough Council has been looked into again, and, in view of the fact that it can be completed out of parts already in stock, without much additional expenditure of labour, it has been decided to grant a permit for its completion, subject to there being no interference with war work. It is necessary to make it quite clear that the Ministry of Munitions is not in a position to supply motor sweeping machines to municipal authorities unless there are exceptional circumstances in any particular case.

Wood Paving in the United States.—Reports compiled from all sources indicate that the year 1916 marked the completion of a total of 25,000,000 sq. yds. of wood-block pavement in the United States.

The Metric System.—The General Assembly of the French Chambers of Commerce has expressed the hope that Great Britain, Japan, and Russia will adopt the metric system in order to favour a closer *rapprochement* with France.

ROAD MAKING AT HASTINGS.*

By G. F. Miller,
Deputy Borough Engineer.

The total length of roads repairable by the corporation of Hastings is 75 miles. The whole of the front line and the principal thoroughfares leading therefrom have been wood paved. This town was foremost in the provinces in adopting Australian Jarrah wood paving blocks, and about seven miles of streets have been paved with this material. The first length was laid in front of the town hall in 1896.

The life of this wood paving has considerably exceeded that estimated for it, principally owing to the care expended upon the preparation of the concrete foundation and floated surface upon which the blocks are actually bedded. Great care was taken to ensure the perfect evenness of the bed, and the setting of concrete and floating before laying the blocks. In the streets already repaved the floated surface has been found practically in its original condition. In relaying works the borough engineer has adopted the herring-bone bond. This is much preferable to the stretcher bond. This locks the blocks, and the effects of shrinkage and expansion of hard wood paving is minimised. The stretcher bond paving has expanded to such an extent as to force up the side walks, and has caused considerable expense for reinstating. Prismatic oak block paving has not stood the test of traffic, and is quite unsuitable. Creosoted deal, used in the relaying of Havelock-road, Norman-road, and Western-road, has proved perfectly satisfactory, and is wearing well.

Many other streets are now becoming in bad condition, and will be repaved as soon as possible. During the past eight months the heavy motor lorries in use by the military have imposed an abnormal wear on the paving material, and the deterioration of the front line roadway, which has been down seventeen years, now approaches the extreme limit.

Tarmac, limestone tar macadam, and Tarvia have been used on suburban roads, and many miles of tar spraying is annually carried out by the corporation staff.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

APPLICATIONS FOR LOANS.

Barnsley T.C.—£7,500 for cemetery extension, and the provision of a maternity home and crèche.

Bolton-on-Dearne U.D.C.—£326 for the proportion of costs in connection with the Dearne Valley electric lighting application.

Cleethorpes U.D.C.—£1,500 for the sewage disposal scheme.

Street Cleaning Methods.—A paper on this subject will be read by Mr. R. L. Honey, assistant borough surveyor, at a meeting of the Royal Sanitary Institute to be held on Saturday, September 29th, at Chatham Town Hall.

A New Book.—A work dealing with the practice of a municipal engineer will shortly be published. The author, Mr. Albert C. Freeman, will be well known to our readers, he being the compiler of "Crematoria in Great Britain and Abroad," which appeared in serial form in the columns of The Surveyor previous to publication in book form.

* Extract from paper entitled "Municipal Works of Hastings and St. Leonards," presented at the annual meeting of the Institution of Municipal and County Engineers.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars have reached us during the present week. Other reports will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Withernsea U.D.C.—The surveyor, Mr. J. H. B. Kirton, has been instructed to prepare a plan for a subway under the new seawall opposite South Cliff-road.

HOUSING AND TOWN PLANNING.

Annfield Plain U.D.C.—A sub-committee are negotiating for a 5-acre site at Dipton for the purpose of a housing scheme.

Bingley U.D.C.—Application is being made to the Local Government Board for authority to prepare a town-planning scheme.

Brighton T.C.—A report has been submitted giving the revenue and expenditure on account of the workmen's dwellings in Tillstone-street, May-road, Dewe-road, Elm-grove, and St. Helen's-road. The total income was £3,540. Rates and repairs absorbed £1,780; and the annual capital charges another £2,263; so that there was a nett deficit of £503. Judging by the comparison with the previous year, the expenditure on repairs was considerably above the normal.

South Shields R.D.C.—Negotiations are in progress with reference to obtaining additional land for workmen's dwellings at Hedworth village.

Stourbridge T.C.—In reply to inquiries by the Local Government Board, the town council state that they have already acquired a site for a housing scheme, and they have referred to the Housing Committee further inquiries as to plans and a provisional estimate.

MOTOR TRANSPORT.

Broadstairs U.D.C.—The surveyor, Mr. H. Hurd, has received instructions to report on the advisability of adopting motor vehicles for the council's work.

Folkestone T.C.—The early delivery of three steam wagons not being possible, it has been determined to purchase a Ford chassis.

Foots Cray U.D.C.—The provision of a motor tractor for scavenging is being considered by a sub-committee.

Hull T.C.—It has been agreed to provide a 1,000-gallon van for hauling behind a steam wagon for street watering. The van will be equipped with 3-in. stand pipes and hose for filling.

Lambeth B.C.—In response to their application for a new petrol licence to cover the six months commencing June 1st for the use of the borough council's motor vehicles, the Petrol Committee made a total allowance of 1,164 gallons, at the rate of 194 gallons per month, as compared with 298 gallons per month granted under the expired licence. As the amount of petrol required for working the two Laffy scouring machines is nearly 400 gallons per month, the surveyor urged the Petrol Committee to reconsider the circumstances, and an order has now been received which will enable the council to obtain the same quantity of petrol as before.

Stretford U.D.C.—Particulars are being obtained with respect to steam-driven vehicles for the removal of house refuse.

Swansea T.C.—Quotations are to be obtained for the supply of three electric tip wagons.

West Ham T.C.—The town council are asking for tenders for the supply of two motor ambulances.

ROADS AND MATERIALS.

Armagh C.C.—The county surveyor, Mr. R. H. Dennison, reported that he had sufficient money in hand to carry out the repairs on the Armagh portion of the Armagh and Portadown road, and the council passed a resolution asking the Lurgan Council to take action to improve their portion of the road.

Blackpool T.C.—The Highways Committee have adopted the report of the borough surveyor, Mr. J. S. Brodie, for the enlargement and improvement of Gynn-square.

Bradford T.C.—The Streets Committee recommend the corporation to carry out improvements at Beck-road, between Bolton-road and Canal-road, at an estimated cost of £1,000.

Branston R.D.C.—As the result of a conference at Lincoln it has been agreed to construct a new street from Boultham-avenue to Coulson-road. It will be 250 yds. in length, of which 110 yds. will be in Lincoln and 140 yds. in the Branston area. The estimated cost of the scheme is £1,400.

Chipping Sodbury R.D.C.—The county surveyor wrote requesting a schedule of roads in the area and the cost of upkeep. The surveyor, Mr. W. M. Hudson, said that the assistant surveyor, Mr. J. Gould, being on service with the Royal Defence Corps, the whole of the work had fallen on his shoulders. In spite of this, demands for returns had continuously increased, in some cases extending over a period of six years. The schedule required statistics embracing three years. To enable the returns to be prepared it was resolved to ask the War Office to release Mr. Gould for three months. The chairman, who proposed the adoption of this course, said it was the only way to get done what was wanted.

Chislehurst U.D.C.—An estimate has been prepared of the cost of repairing Frognal-avenue, which has been damaged by traffic to a temporary hospital.

Devizes T.C.—In consequence of the deficit on the gas undertaking and the increase in the working expenses, it has been decided to raise the price of gas to 4s. 4d. per 1,000 cubic ft.

Devon C.C.—The Bridges and Main Roads Committee have received a statement from each of the county surveyors on the extent of the damage done to the main roads in the county by timber hauling. The estimated cost of reinstating the main roads, so far as they have hitherto been damaged, amounts in the aggregate to £20,955. The Road Board are dealing with all claims in connection with roads damaged by Government traffic (provided the Government department concerned has first admitted liability), and the committee have instructed the clerk and the surveyor for the northern division to interview the Road Board and lay the facts before them so far as they can be ascertained. The surveyor for the northern division having again brought to the committee's notice the extreme difficulty both he and the district councils are having in getting sufficient labour for the maintenance of the main roads, the committee recommend that an estimated sum of £1,000 be set aside for the purchase of various labour-saving plant during the coming year, purchases to receive the previous sanction of the committee.

Donegal C.C.—At the meeting recently of the council the county surveyor, Mr. J. H. Steadman, complained that Letterkenny Rural District Council, at their last meeting, cut down by 50 per cent the tonnage in all his road proposals, while they allowed the expenditure to remain unaltered. On the amended sheet coming before the council all the items were struck out, the chairman (Mr. James Dunleavy) stating that the rural council would have to be taught a lesson.

Hackney B.C.—The council have accepted an offer by the Val de Travers Asphalt Paving Company to reconstruct Northwold-road, and maintain the roadway for a certain period to the satisfaction of the borough surveyor. The proposed work will consist of the excavation of the roadway and the laying of compressed asphalt to a thickness of 1½ in., on a foundation of 6 in. of Portland cement concrete. The estimated cost is £7,350.

Helston R.D.C.—The surveyor for the southern district, Mr. J. Williams, reported that the cost of repairing the damage done to the roads by excessive traffic amounted to £505.

Honiton R.D.C.—The surveyor, Mr. W. North, estimates that the repair of the damage to roads by timber haulage will cost £5,000.

Norfolk C.C.—The Western Highways Committee have received the resignation of the district surveyor for Marshland, to take effect from August 31st. Owing to the difficulty experienced in obtaining the services

of new surveyors it was arranged that the Downham district surveyor should supervise the district. It was also arranged that the Docking and Watton surveyors should supervise the Castleacre district during the absence of the surveyor on military duty.

Montgomery C.C.—The council recently endorsed the resolution of the Cardigan County Council in favour of taxing heavy tractors according to the weight carried.

Norwich T.C.—Certain property in Essex-street and Crook's-place has been purchased for £215, for the purpose of street improvement. It has been agreed to widen Quebec-road.

Tottenham U.D.C.—At the suggestion of the Local Government Board, and in order to expedite the carrying out of war work schemes after the war, it was agreed to make formal application at once to the borrowing of the required sums for repaving Green-lanes, Broad-lane, and Ferry-lane.—The solicitor of the council had directed attention to the result of the recent action against the Sheffield Corporation where damages were awarded owing to injuries caused by the plaintiff colliding with a tree guard which was dangerous under the circumstances of the darkness that existed. All lamp-posts, trees and other similar obstructions, it was now reported, had been properly whitewashed in Tottenham, and the attention of the Metropolitan Electric Tramways, Limited, had been directed to the case referred to.

Weymouth R.D.C.—It has been agreed to carry out certain road improvement schemes at Wyke Regis in association with the Road Board.

SEWERAGE AND SEWAGE DISPOSAL.

Egham U.D.C.—The council have decided to purchase for £81 a motor pump for cleaning cesspools.

Enfield U.D.C.—It has been decided to advertise locally the manurial value of the sludge at the sewage farm, intimating that farmers and others might obtain it in any quantities free of charge.

Huddersfield T.C.—The town council are being urged by the West Riding Rivers Board to carry out a scheme for the improvement of the sewage disposal works.

Norwich T.C.—The city council have approved the recommendation of the Sewerage and Irrigation Committee to provide a new valve for the rising main sewer at Whitlingham, at a cost of £150.

Ryton U.D.C.—The surveyor, Mr. J. P. Dalton, has submitted a report on the desirability of a supplementary sewer for Crawcock, and the matter has been referred to the Sanitary Committee to make an inspection.

South Stoneham R.D.C.—With reference to the notice the Itchen Urban District Council has given that after a certain date they will no longer receive into their drainage system the sewage from Bitterne, the agreement had been sent to the Local Government Board, who now stated that they could not advise the council as to what steps they should take in the matter. They added that, speaking generally, the present was an inopportune time to carry out any new works, owing to the cost of materials and the increased price of labour, but if the council formulated a scheme for dealing with the sewage, and it was submitted to them, they would be prepared to consider it after the present restrictions on the expenditure of capital had been removed. The letter has been referred to the Bitterne Drainage Committee.

WATER, GAS, AND ELECTRICITY.

Aberdeen T.C.—It was reported that the Ministry of Munitions had granted a certificate placing the waterworks among works of national importance.

Battersea B.C.—The Electricity Committee recommended extensions for the supply of electricity at a cost of £1,441.

Brighton T.C.—The nett profit earned for the last financial year by the electricity undertaking was £5,140. This is the first surplus since 1913-14, when the profit was £2,342.

Chester T.C.—The town council on Wednesday resolved to make application to the Treasury for a grant of £200 from the Development Fund for making investigation as to the practicability of generating electrical energy by water-power from the river Dee for agricultural purposes.

Coventry T.C.—The Gas Committee's report showed a surplus on the gas undertaking of £27,190, and after allocating £5,000 for the relief of the rates the town council resolved to carry forward £22,190 to meet the cost of the extension of the works, including the installation of an additional carburretted water-gas plant of a capacity of two million cubic feet, at an estimated cost of £15,750. The nett profit of the water undertaking was £6,903, and of this £5,000 will be paid over to the relief of the rates. On the recommendation of the Electricity Committee the council unanimously resolved to increase the salary of the engineer and manager of the electricity department from £750 to £900 per annum.

Croydon T.C.—The town council have decided to promote a Bill in the next session of Parliament to obtain power to embark on a £250,000 water scheme after the war.

Droitwich T.C.—A satisfactory report was submitted with respect to the gas undertaking, the results, it being stated, reflecting great credit on the manager, Mr. Shewring, whose salary it was decided to increase to £175 a year.

Dublin T.C.—The city council have referred the report of a special committee with respect to the electricity undertaking to the Electric Supply Committee to deal with. The special committee recommended that Mr. Ruddle, city electrical engineer, should be appointed during a period of two years to take entire charge not only of the electrical engineering section, but also of the commercial department of the undertaking.

Hackney B.C.—The Electricity Committee recommended the borough council to proceed with the extension of the electricity undertaking, at an estimated cost of £9,685.

Hexham R.D.C.—In a report on the local water supply to the Haydon Bridge Parochial Committee, the engineers, Messrs. J. R. and L. E. Hetherington, state that the daily estimated amount of water required, 34,000 gallons, can be obtained at the source, but that the present main pipe is insufficient to bring it. The approximate cost of laying a 6-in. main would be about £1,500, but they think that consideration ought to be first given to the advisability of getting permission to take in the spring which lies to the south of Elrington to augment the supply rather than proceed at the present time with the new 6-in. main, owing to the heavy cost of materials. The subject will be further discussed by the committee at the next meeting.

Holsworthy U.D.C.—The council have referred the question of the water supply to the Water Committee, with power to act. For some years the medical officer of health, Dr. Gray, has expressed the opinion that the filter-beds are wrongly constructed and very defective, and that a large quantity of surface water is allowed to drain into the impounding reservoir. The banks of the reservoir consist of peat. The Local Government Board has lent money to the council for this purpose, but the work has never been done.

Hull T.C.—The nett profit on the electricity undertaking last year was £1,209, compared with £4,247 for the previous year. At a meeting of the committee a report was submitted on the question of linking up the tramway power station with the electricity works. At present there are two separate power stations, one for lighting and power and one solely for the tramway service, and there are two separate staffs. It was resolved that, subject to the Tramway Committee deciding to take a supply of electricity, the Electricity Committee were prepared to provide such supply, and that the question of terms be left in the hands of the chairman, deputy chairman, and engineer.

Lancaster T.C.—The town council on Wednesday decided to retain Parliamentary agents in connection with the promotion of a Bill for a water supply scheme and other purposes.

Tonbridge U.D.C.—It has been agreed to carry out a scheme of extensions at the electricity works, at an estimated cost of £17,000.

MISCELLANEOUS.

Coventry T.C.—It was reported that the tramways undertaking had yielded a nett profit of £7,766.

Dundee T.C.—At a meeting of the Works Committee the convener, Mr. A. Spence, raised the question of the salaries of the chief officers in relation to war conditions. He stated that no increase had been granted to the members of the city engineer's staff since 1913. The estimates of the Department were reduced last year by £2,000, and it was expected that the expenditure for the past year would be £100 under the estimates, but the city engineer, Mr. Thomson, had

rearranged the staff in such a way that the proposal by Mr. Spencer) was to make with regard to an increase to the staff would not affect the aggregate sum paid; in fact, it would be rather less. They did not appoint a qualified inspector when the late Mr. M'Dougall died. His son gradually filled his father's shoes, but he had also died. Their joint salaries amounted to £418. It was not proposed to appoint a qualified inspector now. Mr. Thomson had promoted a man from the ranks to be an inspector, and the proposal now was to give a 10 per cent increase to members of the staff. That would amount to £246 per annum, but under the rearrangement of the staff there would be a saving of £172. Eighteen employees, with salaries ranging from £75 to £250 per annum, would be affected.—The committee passed a motion in favour of the proposals.

Keighley T.C.—The General Purposes Committee have been authorised to consider the question of a supply of coal for the poorer classes.

Okehampton T.C.—The question of a municipal supply of coal has been referred to the General Purposes Committee for investigation.

Electricity Supply.—It was stated in reply to a question in the House of Commons that the Departmental Committee on Electricity had not prepared a report in favour of dividing the whole country into definite areas for the production of electricity.

Nottingham Waterworks.—For the third consecutive year there has to be recorded a loss in the year's working of the Nottingham water undertaking. This is due to certain extraordinary expenditure arising out of existing conditions, of which the principal items are: Increased cost of coal, £2,649; increased income tax, £6,094; increased wages, £662; and increased insurance, £393; making a total of £9,798. The nett deficit for the year amounts to £1,866.

Potteries Tramways.—Stoke-on-Trent Town Council on Wednesday considered the tenure of the tramways and light railways by the Potteries Electric Traction Company, and amendments rejecting an agreement to extend the lease of the tram lines till 1932, when the lease of the light railways fall in, and also to defer the consideration of the agreement till 1923, were defeated. The agreement provides for a future expenditure of £30,000 on the permanent way and rolling stock and the payment to the council of £1,500 per annum.

Local Authorities and Coal Distribution.—In reply to a question in the House of Commons on Tuesday, Mr. Roberts said a conference of local authorities in the London area was held at the Local Government Board on Thursday of last week to discuss the general question of an improved distribution of coal. It was attended by representatives of six county councils, twenty-one metropolitan borough councils, three town councils, and eleven urban district councils. A resolution was passed urging that local authorities should be authorised to buy, store, and distribute coal. This proposal would receive full consideration. The Controller of Coal Mines hoped to put his scheme for controlling distribution before the local authorities next week, after which the matter could be further considered.

FOR OTHER ADVERTISEMENTS

See End of Paper.

LAMBETH METROPOLITAN BOROUGH COUNCIL.

Applications are invited for the appointment of a Temporary Assistant in the Borough Engineer's Department. Applicants must be good draughtsmen, capable of undertaking levelling and surveying work, and ineligible for military service. Applications, stating experience, age, and salary required, to be sent to the undersigned.

H. C. J. EDWARDS,
Borough Engineer,
Town Hall,
Brixton-hill, S.W. 2.

(3,448)

OLD ROCK ASPHALTE wanted, as taken from ... Also Blocks, roadways, &c. Large or small quantities. Good prices given. Address Box 1,612, ... The Surveyor, 24 Bride-lane, Fleet-street, E.C. 4. (3,449)

PERSONAL.

Mr. Evan Watkins, of Llanfair, has been appointed main road inspector for the Llansantffraid division by the Montgomery County Council.

Major A. E. Prescott, R.E., the borough engineer of Eastbourne, who is on active service in France, has been promoted to the rank of Lieut.-Colonel in the Royal Engineers.

Mr. G. J. Wilkinson, superintendent of the Waste Department in the Eastern District of the Metropolitan Water Board, is retiring from that position. The vacancy will not be filled.

Mr. Rees Jones, borough surveyor of Aberystwyth, received a warm welcome from the town council last week on his reappearance after a long illness. The Mayor, on behalf of the council, extended to him hearty congratulations on his recovery, and added that they were pleased to see him looking his old self again.

Captain E. J. Stead, of the Royal Engineers, county surveyor of Somerset, has been awarded the Military Cross for distinguished service in the field. Captain Stead originally enlisted as a Lieutenant in the 4th Labour Battalion, R.E., but has since been promoted to the rank of Captain, with an appointment under the Road Services Battalion in France.

Mr. Geoffrey Wilson, surveyor to the Alnwick Urban District Council, has been appointed to the additional office of inspector of nuisances, at a salary of £100 a year. In returning thanks for his appointment—which has been approved by the Local Government Board—Mr. Wilson said that "history had repeated itself, for he was appointed to the offices of surveyor and inspector forty years ago."

Mr. Philip H. Palmer, M.INST.C.E., F.R.S.INST., the new president of the Institution of Municipal and County Engineers, has had many years' experience in his profession. He was educated at the High School, Nottingham, under the late Dr. Dixon, and commenced his career under the late Mr. W. H. Stubbs, M.I.C.E., resident engineer of the Great Northern Railway, on the construction of the line from Nottingham to Pinxton and the Sedgebrook to Barkstone Railway. He afterwards entered the service of the late Mr. B. S. Brundell, M.I.C.E., of Doncaster, who was at that time a leading authority on the disposal of sewage by land treatment, and was engaged for some years upon numerous sewage disposal schemes, waterworks design, and construction and Parliamentary work. He was for some time with the firm of the late Major-Gen. H. Y. Scott, C.B., and Mr. G. R. Redgrave, of Westminster, being engaged principally upon sewage disposal schemes. In 1882 he was appointed deputy borough engineer and surveyor of Brighton, under the late Mr. P. C. Lockwood, M.I.C.E., and in 1888 was appointed borough engineer and surveyor of Hastings. During the time Mr. Palmer has held his appointment in Hastings he has had charge and control of the engineering, architectural and surveying work of the borough, which has embraced the design and construction of a new water supply to the town, the reconstruction of its sewerage system, sea defences and promenades, and the laying out of parks and a cemetery, the whole involving a capital expenditure of nearly £1,000,000. He was elected an associate member of the Institution of Civil Engineers in 1884, and transferred to the class of members in 1897. He joined the Institution of Municipal and County Engineers in 1900. Mr. Palmer—a portrait of whom appears in the form of an inset with this issue—is a past president of the Institution of Water Engineers, being one of its original members, and is also a Fellow of the Royal Sanitary Institute.

OBITUARY.

Mr Charles E. Wynn, sanitary inspector to the Whitehaven Rural District Council, died, we regret to state, last week, at the age of 42.

Coast Sand Dunes. (By Gerald O. Case, St. Bride's Press, Limited, 24, Bride-lane, E.C. 4, price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Heywood's Gas Deficit.—Explaining a loss of £282 on the gas department of the Heywood Corporation last year, the engineer says that the income tax paid amounted to £1,948, compared with £443 in 1913, and that coal is costing 19s. 9d. a ton, compared with 13s. 5d. five years ago.

Standardisation of Cast-Iron Pipes.

[At the Summer Meeting of the Institution of Water Engineers, held in London on Friday last, the following report was presented by Messrs. Wm. Matthews, F. J. Bancroft, and P. H. Palmer.]

Your representatives upon the Engineering Standards Committee, appointed to deal with the question of the standardisation of cast-iron pipes, have now the satisfaction of reporting that, the labours of the committee having been concluded, the specification for and tables of standard pipes and special castings will very shortly be published and made available for general use.

The institution so far back as 1903 considered this question, and collected some data and information which, later on, was handed to the Engineering Standards Committee, with the request that they would deal with it, as it was then felt that, owing to its established organisation and command of funds, and the support and co-operation it was favoured with by many of the Government departments and engineering institutions, that committee was in the best position to deal with the subject in an authoritative manner, and produce what would be generally and publicly accepted as a British Standard.

The ever-growing practice, in the public services as well as in all branches of engineering, of adopting and using the various standard specifications, already published by the committee, shows clearly the wisdom of the course pursued by the council in 1903.

A perusal of the list of members composing the sectional committee to whom, under the chairmanship of Mr. Charles Hawksley, was entrusted the work of standardising cast-iron pipes of all kinds will indicate its thoroughly representative character and give some idea of the large amount of practical experience thereby placed at its disposal.

At an early stage in the proceedings it became evident that there existed, even amongst the most eminent engineers, great diversity of practice, and your representatives desire to bear testimony to the broad-minded and unselfish spirit exhibited by those who, after full enquiry, voluntarily abandoned so much which, as the result of long and successful practice, they had come to regard as ideal.

The future general adoption of these standards may be taken as assured, for they have the full support of the Pipe Founders' Association, as well as of the engineering representatives on the committee, and it is to be anticipated that, after a comparatively short time, both difficulty and additional cost will be incurred in obtaining any pipes or castings which do not conform to these standards.

Your representatives trust that the council will recognise the desirability of informing all the members of the institution of the existence of the standard specification and tables, and urge upon them their immediate adoption.

The work of the sectional committee was conducted under four heads, by sub-committees who dealt with the details, but whose findings had to be endorsed by the sectional committee.

Your representatives were not members of either of the sub-committees on cast-iron pipes (1) for hydraulic power pipes; (2) for heating, ventilation and house drainage; or (3) for electrical purposes; and did no more than vote for the adoption of the several specifications when presented to the sectional committee.

The sub-committee on "Cast-iron Pipes for Gas, Water, and Sewerage Purposes" consisted of twelve members, and until May, 1915, was under the able chairmanship of the late Mr. Henry Rofe, he being succeeded in the position by Mr. W. Matthews, one of your representatives.

The task with which the committee was confronted, though appearing simple, was, in fact, exceedingly complicated, and unforeseen difficulties constantly presented themselves, which formed the subject of close analysis and investigation both of a theoretical and practical nature. To indicate in some measure the scope of the enquiry, the following are but some of the matters which had to be enquired into, viz.:—

A mass of data illustratjve of the practice of engineers and pipe-founders in this country, America, and on the Continent.

The physical properties of cast iron.

The best means of testing the metal, and the form which the test bars should take.

The working stresses, and factors of safety to be adopted.

The stresses set up upon the cooling of pipes after casting, particularly as affecting the designs of sockets.

The investigation of formulæ proposed for use in fixing the thickness of metal to sustain internal pressures.

Practical considerations involved in foundry practice, which limit the minimum thickness of pipes, irrespective of the pressure to which they may, when in use, be subjected.

The limitations of maximum thickness necessary to avoid the distortion of large pipes when being rolled, and of the fracture of pipes in general during transit, while being handled, and when subjected to external pressure.

The strength and best form of joint, lead space, and free caulking room, the last being particularly needed in the case of special castings with outlet pipes.

The relative advantages of keeping either the internal or external diameter of any sized pipe the same for all or a number of test pressures.

The classification of pipes to suit various test pressures, and of special castings to correspond thereto without undue multiplication of patterns.

The design and forms of special castings.

The temperatures at, and conditions under which, pipes should be coated.

The methods to be adopted in moulding, casting, and testing pipes.

Calculations of the weights of pipes of the sections specified and determination of the reasonable limits of deviation from normal thickness and weight.

Adverting to the specification itself, attention may be directed to the chief points of interest, viz.:—

(1) *Range of Standards.*—Socket and spigot pipes, with both plain and turned and bored joints, have been standardised up to 48 inches diameter, in lengths of 9 feet from 3 in. to 12 in. diameter, and lengths of 12 feet from 4 in. to 48 in. diameter. Flanged pipes and special castings have not been standardised above 24 in. diameter, as the demand for such is very limited and the conditions under which they are to be used frequently call for special designs.

(2) *Division into Classes.*—There are to be four classes of pipes, A, B, C, and D, varying in thickness to withstand the respective test pressures of 200, 400, 600, and 800 feet head of water, while it is recommended that the working pressures shall not exceed one-half of the test pressures.

Class A pipes are only intended for gas or other purposes where the working pressures are low.

The special castings have been divided into two classes only, so designed that one pattern suits Classes A and B pipes, and the other Classes C and D pipes. By this means the number of standards for specials has been halved.

(3) *Jointing-up Pipes of Different Classes.*—The standards have been so designed that pipes and specials of all classes up to 10 in. diameter can be jointed together and leave a sufficient lead space for caulking. Above 10 in. diameter the pipes of Classes A and B can be interchanged, as also can those of Classes C and D.

(4) *Constancy of External Diameter.*—In order to render the pipes and castings interchangeable it was necessary to standardise the external diameter and allow the internal diameter to vary slightly with the thickness and describe it as the nominal diameter or bore. This has had the effect of enormously reducing the number of patterns, as those for the barrel and socket, of any group, remain the same throughout.

The variations are really trifling. Thus a pipe of 3 in. nominal bore may vary between 3·09 in. and 2·96 in. diameter and a 48 in. pipe between 48·00 in. and 48·44 in. diameter according to its thickness or class. In practice this can have no measurable or important effect as, in the first place, it has not been the practice to split inches of diameter and, in the second place, it is exceedingly doubtful whether, in any pipe-line, the relationship between the actual and theoretical discharge may not vary to an extent

greater than would be produced by the small differences in diameter in the proposed standards. In any case it is simply a matter for calculation for those who prefer to work within such narrow limits.

(5) *Strength and Testing of Cast Iron.*—The tensile strength has been fixed at the minimum of 9½ tons per square inch, and the transverse strength, on the standard 2 in. by 1 in. bar with supports 36 in. apart, at the minimum of 28 cwt. and deflection of ·33 inch. The forms and dimensions of the test bars are illustrated in an appendix to the specification.

(6) *Methods of Casting.*—Needless to say it is provided that all pipes shall be cast vertically, and with the sockets downwards, and the proper precautions taken to ensure concentricity and straightness.

(7) *Testing Pipes and Castings.*—The methods and appliances to be adopted and used for gauging the castings and testing the finished pipes under pressure are described.

(8) *Variations in Thickness, Length, and Weight.*—The tolerances above and below the normal thickness, length, and weight have been fixed, but, after much consideration, it was decided not to introduce into a technical specification any clause touching the question of the actual weight to be paid for by the purchaser, this being considered as a purely commercial matter, which would more properly be dealt with as a clause in the "general conditions of contract" or "agreement."

It may, however, be observed that the system of payment at a price "per pipe or casting" is the simplest, and entails no calculation as to the deduction to be made for individual pipes or castings being heavier than the maxima weights specified, while all light-weight pipes would be rejected upon inspection.

(9) *Coating Pipes.*—The enquiry showed that many current specifications provided for the heating of both the pipes before coating and the composition itself to unsuitable temperatures, such as would volatilise the lighter oils, and thus continuously change the consistency of the composition.

(10) *Marking, &c.*—Provision is made for using standard forms of identification markings, including the brand mark of the Engineering Standards Committee, and for weighing and registering the weights of all pipes and castings.

(11) *Makers' Certificate.*—To meet cases where pipes or castings are bought from stock, or where the purchaser does not employ an inspector, provision is made for the issue, upon demand, of the makers' certificates, based upon the tests of the iron from which the batch of pipes was cast, and upon the hydraulic test applied to each pipe.

(12) *Flanges and Machinery.*—The circular and bolt-hole dimensions of all flanges are to follow the existing standard flange specification, which is in general use by engineers and valve-makers; while the thicknesses are arranged in two classes, AB and CD, and set out in Table 13 of the specification.

Provision is made for the machining of all flange faces, and of the sockets and spigot-ends of turned and bored pipes. The taper on the latter has been fixed after careful enquiry, it having been found that if this is too steep the pipes rebound rather than make a good fit when driven up at the time of laying.

(13) *Inspection and Testing.*—The right to inspect test upon the founders' premises is fully safeguarded and provision made for independent testing elsewhere if required.

(14) *Arbitration.*—Matters in dispute arising out of the specification are to be the subject of arbitration by a single arbitrator, to be agreed upon between the parties or, failing agreement, appointed by the chairman of the Engineering Standards Committee for the time being.

(15) *Tables.*—The specification is accompanied by fourteen tables showing: (*a*) The dimensions and weights of each size and class of pipe; (*b*) the dimensions of each size and class of socket and spigot for pipes and specials; (*c*) the dimensions of standard flanges, and (*d*) the dimensions of ¼, ½, ¾, 1, and 2 inch bore 45 deg. branches, enlarging and reducing tapers, and collars.

In order to limit the number of standard tapers, differences in the diameters of the ends have, in general, been restricted to 2 inches, and where greater differences have to be provided for, the tapers will have to be used in combinations of two or more.

It was found that in certain cases the size and weight of special castings in use was excessive, and while having due regard to the lengths necessary to ensure proper room for hammer swing when caulking the joints of junctions, tees, and bends, the lengths of all special castings have been kept within moderate limits.

For the present the weights of specials have been omitted from the tables, as in many cases these could not be calculated with the proper degree of accuracy, and it was deemed better to wait until the actual weights of batches of castings, conforming to the dimensions specified, could be ascertained.

(16) *Periodical Revision of Specification.*—Following the established practice of the Engineering Standards Committee the specification will, when necessary and at least annually, come up for revision, when suggested amendments or enlargements will be considered and dealt with by the sectional committee, it being of a permanent character.

In concluding this report your representatives desire to place on record their appreciation of the courtesy and assistance rendered to them at all times by the secretaries and staff of the Engineering Standards Committee, and to express their profound regret that the late secretary, Mr. Leslie S. Robertson, who, with Lord Kitchener and others, was lost at sea, did not live to see the completion of a work in which he so ably assisted.

HASTINGS DRAINAGE.*

By G. F. Miller,
Deputy Borough Engineer.

The town of Hastings and St. Leonards is practically a contained watershed. At the time of the Local Government Board's sanction to the extension of the borough the new limits were governed to a great extent by the watershed area and by the fact that the drainage systems of the authorities it was sought to incorporate were within this area and would eventually have to be dealt with by the sewers and outfalls of this corporation. The district has a ridge of hills about 400 ft. above sea level for its northern boundary, whence three valleys descend towards the sea. There are three outfalls to the sea within the district. The main or Rock-A-Nore outfall works are at the east end of the town and consist of a storage tank of 1,000,000 gallons capacity with iron outfall 4 ft. diameter discharging below low-water mark of spring tides at the extreme east boundary.

The discharge of the sewage in normal weather is so controlled that the outfall does not come into operation until the beginning of the flood tide which takes the sewage well to the eastward and away from the town. This outfall deals with all the district east of the South Colonnade. The main intercepting sewer passes from this locality along the front line to Rock-A-Nore, intercepting the drainage of the three valleys. These have considerable streams which in the early days of the town's development were culverted in the lower districts with brick barrels 4 ft. and 5 ft. in diameter, and many sewers were ultimately connected with these.

The prevention of the frequent flooding caused by the great volumes of storm water which discharge from these culverts into the intercepting sewer has been a problem which the borough engineer has successfully solved by the construction at their junction of weir chambers and storm water overflows, causing the dry-weather and normal wet-weather flow to be intercepted and passed to Rock-A-Nore, while excessive rainfall which formerly surcharged the system overflows the weirs, bringing the storm water outlets to the sea into operation and thus preventing flooding.

The second outfall is at that part of St. Leonards known as "Bopeep"; it practically takes the limited area of the old St. Leonards Commissioners. The sewage is stored and held up until half ebb tide, when it is discharged and is sufficiently out to sea by the time the flood tide sets in as not to be traced.

The third outfall is near the extreme west of the borough and is the outfall for the outlying Hollington and Bulverhythe districts. This drainage system is of recent construction and is on the separate system. The borough engineer designed these works soon after his appointment. The level of Bulverhythe is below high-water mark. This district is drained on the "Shone" system, the sewage gravitating to

* Extract from paper entitled "Municipal Works of Hastings and St. Leonards," presented at the annual meeting of the Institution of Municipal and County Engineers.

ejectors, whence by means of compressed air it is automatically lifted to the outfall tank. Formerly the air-compressing plant was at the outfall works, but a few years ago the air mains became leaky and the works were reorganised, the compressing plant being installed at Filsham Pumping Station half a mile distant, where it is attended to by the ordinary staff, thus effecting a considerable economy in working expenses.

The sewage is of a weak character consisting of much laundry waste water. It is held up in a storage tank, the effluent being drawn off by floating arm wastes, and runs in an innocuous state into the sea at an unfrequented part of the borough.

The tributary sewers of the whole system other than culverts of old streams are mainly constructed with stoneware socketed pipes, all new drains, of which many miles have been relaid or extended by the borough engineer, are bedded on concrete foundations 6 in. in thickness and haunched up to springing level, and all pipes and sewers have been water tested. The velocities being self cleansing, except in a few isolated instances, it is only in dry weather that flushing has to be resorted to, and no deposit requiring removal forms in any part of the system.

Ventilation is assured by up-cast shafts and street columns; advantage has been taken of the few tall chimney shafts in the borough to carry ventilators above the fire-brick linings into the shaft itself.

The commercial undertakings in the town being very limited in number, the sewage is of domestic character. None of the sewage is treated.

The drains of all houses erected in this town since 1886 have been water tested, and practically the whole of the old property has been redrained under similar stringent conditions. A large proportion of the property has been fitted with baths.

The freedom of the borough from zymotic disease is eloquent testimony to its sanitary condition.

THE MILITARY AND THE ROADS.

THE QUESTION OF MAINTENANCE AT DARLINGTON.

At a recent meeting of the Darlington Rural District Council a letter was read from the Road Board (the *Darlington Times* reports) stating that they had spent £2,222 during the six months ending last December in the maintenance of the road to a local camp, and asking what proportion of the cost the council proposed to contribute.

The surveyor (Mr. J. Hodgson) said that several of the roads were cut up and damaged during the building of the camp, and had not been repaired. The road through one place was very much damaged, and another road was in a very bad state.

Mr. H. W. Walton asked what was the amount of the difference between the cost of maintenance now and before the military came.

The surveyor replied that there was no comparison, as the roads had now a tremendous traffic upon them, chiefly military.

The chairman (Mr. G. T. Gilpin-Brown, J.P.) asked what was the proportion of the civil traffic over the roads, which he said were in very good order when taken over by the military, and had a very light traffic.

A member said there was only 10 per cent of such traffic.

Mr. W. Mack thought all they should pay was the average amount of the cost of the maintenance of the roads before the roads were worn away by the military, who now asked the district council to pay.

The Chairman: They think that as the roads serve the population of the district the council should contribute towards them.

The surveyor pointed out that the Road Board did not say that they had expended the amount mentioned on the roads that the council used to maintain.

Mr. Mack: It is a big amount in six months, and if we pay only a fourth it will be a serious thing for this district. The amount is ten times as much as what the roads cost before. If the camp was rated as it should be it would be all right, but we are not getting relief in that way for it.

The chairman suggested that the surveyor should submit an estimate of the increased cost of the various roads since they were taken over, and that it should be considered at the next meeting.

This was agreed to.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

ANNUAL SUMMER CONFERENCE.

The annual summer conference of the Association of Managers of Sewage Disposal Works will be held at Worcester on Saturday, July 7th.

PROGRAMME.

11 a.m.—Assemble at the Guildhall.

Dr. Sidney Barwise, B.SC., will deliver his presidential address.

Mr. Thos. Caink, ASSOC.M.INST.C.E., city engineer, will read a paper on "The Activated Sludge Process of Sewage Purification."

2 p.m.—Visit to the Worcester Sewage works to inspect the activated sludge installation in operation.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR'S TEMPORARY ASSISTANT.—July 2nd.—Chesham Urban District Council.—Mr. Percy C. Dormer, engineer and surveyor, Council Offices, Chesham, Bucks.

SEWAGE WORKS MANAGER.—July 4th.—Aspley Guise, Aspley Heath and Woburn Sands Drainage and Water Supply.—Mr. W. J. Budds, sanitary inspector, North-street, Stantonbury, Bucks.

DESTRUCTOR ENGINEER.—July 4th.—Gainsborough Urban District Council. 40s. per week, with 2s. 6d. war bonus and house, coal, and rates free.—Mr. S. W. Parker, waterworks engineer and surveyor, Council Offices, Gainsborough.

FOREMAN.—July 6th.—Deptford Borough Council. 53s. per week.—Mr. F. Wilkinson, borough surveyor, Town Hall, New Cross-road, S.E. 14.

SURVEYOR AND INSPECTOR OF NUISANCES.—July 7th.—Chepstow Urban District Council. £200—£250 a year. Mr. F. Evans, clerk, Council Offices, Bank Buildings, Chepstow.

TRAMWAYS ENGINEER.—July 9th.—London County Council. Rolling-stock engineer, £1,000 to £1,200, according to qualification; and permanent-way engineer, £800 to £1,000.—Clerk of the Council, County Hall, Spring Gardens, S.W. 1.

CITY ENGINEER AND ENGINEER OF WATER AND SEWERAGE WORKS.—December 1st.—Port-of-Spain City Council, Trinidad, B.W.I. £600-£750, with £75 towards the upkeep of a motor cycle.—Mr. Philip H. Salomon, acting town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

ASSISTANT ELECTRICAL ENGINEER.—For the Eastern Command. £240 a year.—Chief Engineer, Eastern Command, 50, Pall-mall, S.W. 1.

SANITARY INSPECTOR.—Rochester Town Council.—Mr. A. Kenneth, town clerk, Rochester.

DRAUGHTSMAN.—Gold Coast Government Railway. £350—£400 per annum.—Crown Agents for the Colonies, 4 Millbank, London, S.W. 1.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HIPPERHOLME.—July 2nd.—For the construction of 130 lineal yards of dry walling and reconstruction of red brick bridge, for the urban district council.—Mr. G. W. Thompson, engineer and surveyor, Council Offices, Hipperholme, Yorks.

CLYDEBANK.—July 10th.—For the erection of 100 houses at Clydebank, for the Commissioners of Works.—Secretary, H.M. Office of Works, Storey's Gate, London, S.W. 1.

SOUTHAMPTON.—July 11th.—For alterations and additions to the laundry, for the Guardians.—Messrs. Jurd and Sanders, architects, Bargate Chambers, 1, High-street, Southampton.

Engineering: Iron and Steel.

KEIGHLEY.—July 4th.—For concreting the bottom of the reservoir, for the rural district council.—Mr. T. Burnes, surveyor, Market Chambers, Keighley.

CAPE TOWN.—July 31st.—For the construction of tanks and percolating beds for sewage disposal and other works in connection therewith, for the corporation.—City Engineer, City Hall, Cape Town, and the Department of Commercial Intelligence, 73, Basinghall-street, E.C. 2.

Mechanically Propelled Vehicles.

WARRINGTON.—July 4th.—For the supply of a motor tower wagon, for the Electricity and Tramways Committee.—Mr. F. V. L. Mathias, borough electrical and tramways engineer, Howley, Warrington.

MANCHESTER.—July 10th.—For the supply of two four-cylinder petrol-driven turbine motor fire engines, for the Watch Committee.—Chief Officer, the Fire Brigade.

Roads.

GRIMSBY.—July 2nd.—For tar spraying or painting about 15,000 super. yards of road surfaces, for the rural district council.—The Surveyor, Rural Council Offices, Grimsby.

COTTINGHAM.—July 2nd.—For the supply of 1½-in. and 2½-in. broken stone, ⅜-in. and ½-in. screened chippings, and ½-in. unscreened chippings, also for carting stone, for the urban district council.—Mr. J. H. Hanson, surveyor, Market-green, Cottingham, Yorks.

GRIMSBY.—July 9th.—For the tar sanding and repair of the school playgrounds, for the Education Committee.—Mr. Douglas Chandler, clerk, Education Offices, Grimsby.

LAMBETH.—July 11th.—For the construction of concrete foundations in Upper Kennington-lane (a total approximate area of 7,000 yards), prior to paving with compressed asphalt, for the borough council.—Mr. Henry Edwards, borough engineer, Town Hall, Brixton Hill, S.W. 2.

Sanitary.

WINSFORD.—July 3rd.—For the removal of the peat pails and night soil, for the urban district council.—Mr. T. Hickson, inspector of nuisances, Market-place, Winsford.

WREXHAM.—July 4th.—For the removal of house refuse, for the rural district council.—Mr. G. V. Price, interim clerk, Council Offices, Midland Chambers, Wrexham.

FORTHCOMING MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

28-30.—Institution of Municipal and County Engineers: Annual Meeting at Hastings.

29.—Tramways and Light Railways Association: Annual Congress. Institution of Civil Engineers, Great George-street, Westminster. 2.30 p.m.

JULY.

7.—Association of Managers of Sewage Disposal Works: Annual Summer Conference at Worcester.

10.—Institute of Cleansing Superintendents: Annual conference at Nottingham.

APPOINTMENTS OPEN.

PORT-OF-SPAIN CITY COUNCIL.

POST OF CITY ENGINEER.

The Port-of-Spain City Council invite APPLICATIONS for the Post of CITY ENGINEER, and ENGINEER OF WATER AND SEWERAGE WORKS, with which is associated also the general supervision of the management of the Woodbrooke Estate and the Cocorite Farm.

2. The salary attached to the post is £600 a year, rising by annual increments of £25 a year to a maximum of £750, with an allowance of £75 a year towards the upkeep of a motor vehicle for the performance of his duties.

3. The appointment is subject to the approval of the Governor.

4. The office is pensionable under the Port-of-Spain Corporation Ordinance, 1914.

5. Salary will commence from the date of arrival in Trinidad. No allowance is made in respect of passage.

6. Candidates must submit evidence of their being corporate members of the Institution of Civil Engineers of England, and of possessing experience in the designing, construction, and maintenance of waterworks and sewerage systems.

7. Should the officer be desirous of leaving the service of the Corporation within five years from the date of his appointment, the Council reserve to themselves the right to exact not less than three months' notice in writing.

8. The Engineer will be required to reside within the City or within a mile of the City, and to devote his whole time to the service of the Corporation.

9. The successful candidate will be required, within one month of the date of his arrival in the Colony, to furnish a bond with an approved surety, or to enter into a bond with an approved guarantee society, in the sum of £500 for the due performance of the duties of the office.

10. The successful candidate must be prepared to take up the duties of his office within three months of the date of his receiving the official intimation from the Town Clerk that his appointment has been approved by the Governor.

11. Applications, accompanied by not more than two recent testimonials (one of which should be from the candidate's present employers), and stating age and previous experience, together with a medical certificate that the candidate is fit for service in the West Indies, must reach the Town Clerk, Port-of-Spain, Trinidad, not later than the 1st December, 1917.

PHILIP H. SALOMON,
Acting Town Clerk.

Town Hall,
Port-of-Spain,
Trinidad, B.W.I. (3,445)

RURAL DISTRICT COUNCIL OF GLANFORD BRIGG.—Steam Roller Driver.—Wanted, Steam Roller Driver. Permanency for suitable man.—State wages, &c., to Chas. A. Howard, Surveyor, Brigg, Lincs. (3,446)

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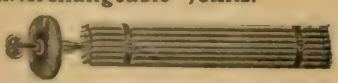

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The Surveyor and municipal engineer

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